BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY.

Vol. XXXV 1903. No. 5

TWO YEARS IN ARGENTINE AS THE CONSULTING ENGINEER OF NATIONAL PUBLIC WORKS.

A LECTURE BY

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Mr. Chairman, Ladies and Gentlemen:

In 1899 the Argentine Government, having conceived an extensive project of river and harbor improvement, and made the preliminary surveys, requested the U. S. Government to recommend an engineer who would come to Argentine and assist the Government by his advice in forming and executing the plans.

I had the honor of being selected for this position. After carrying out a two years' contract with that Government, I have returned to my own country with some knowledge of the conditions and some experience in meeting them which form the basis of this lecture.

At the final general session of the International Navigation Congress at Düsseldorf, July 4th, this last year, when called upon to respond for the Argentine Republic, I used the following words:

It may not be out of place to make a few comparisons between the two countries which by a singular coincidence I have the honor to represent—one as a delegate to this Congress, the other as a member of the Permanent International Commission. One of these countries is the Argentine Republic and the other the United States of North America.

Both are cosmopolitan, both have been populated largely from Europe; both had the task of supplanting savagery by civilization. The red races in each case had to give way to the Caucasian, or be assimilated with it. Both have great plains and immense river systems. The greatest river valley of the one is almost exactly equal to that of the other. Similar causes have produced nearly similar hydraulic conditions in each case. Both countries have temperate climates, both great mountain ranges; both some extent of arid lands and running waters for irrigation; both immense

areas of rich soils, made so by similar beneficent causes; both have excellent pasture lands and millions of cattle, sheep, and horses. In their cereals they are competitors with each other in the food markets of Europe—one is great and ambitious, the other smaller but earnestly devoted to progress and ambitious to fulfill its high destiny among the nations of the earth.

I shall compare Argentine with the United States in respect to some of its more important features, and you will see that the two great countries have much in common.

You must, if possible, imagine yourselves in a situation exactly opposite from yours in the United States in regard to the sun and the poles of the earth; you must look north for warm winds and south for cold ones. Your winter will begin in June and your summer in December. The north side of your house will be sunny and the south side in the shade. As you travel north from Buenos Aires, the capital, it will grow warmer; as you go south you will at last reach the glaciers. Your north star will be changed to the Southern Cross, and in all these changes you will at first be lost. You must also locate yourself geographically, and recollect that the northern line of Argentine is in about the same latitude south of the equator as Havana is north of it, and that the southern limit of Argentine corresponds to Labrador and Kamchatka; and that Buenos Aires, Capetown, and Melbourne are all in about the same latitude. Also that there are east and west differences. Buenos Aires is in about the same longitude as Cape Breton Island, east of Nova Scotia, and the circle of longitude along the most westerly boundary of Argentine nearly passes through New York City; and the course from the entrance of the River Plate to Liverpool is nearly a straight line. In order that the location of Argentine in reference to other South American countries may be appreciated, it should be stated that Buenos Aires is as far south of, say, Caracas, the present centre of revolutionary and unstable South America, as the north end of Lake Winnipeg, in Manitoba, is north of Caracas, or as far as the northern part of Greenland is north of New Orleans.

With this orientation of ourselves on the Western Hemisphere, and with these remarkable differences in position, let me call your attention to a very remarkable similarity.

In a paper read before the American Association for the Advancement of Science, at Buffalo, Aug. 5, 1896, upon the delta of the Mississippi, I described the ancient conditions of that great river in substance as follows:

First, a deep shore-line of the Gulf of Mexico when the site of Galveston was far out in the waters and the coast was 100 miles

inland from the site of New Orleans; a wide and deep estuary, 1,000 miles long, reaching into the heart of the continent to between St. Louis and Cairo, where, at Cape Girardeau, it met the ridge of the Ozark Mountains, stretching across the valley and holding back the ancient Great Lake, which covered Chicago 200 feet deep, and spread over all the great prairie States, and received and distributed over its bed the immense sediments of the Missouri and other great rivers in the north. Then came the cyclic change, lifting Florida out of the water and turning continental drainage north, cutting its way through the alluvion to Hudson's Bay. Then the breaking down of the Ozark barrier; the draining of the submerged area; the subsequent filling of the estuary and the advance of alluvial lands into the Gulf to their present line, 110 miles beyond New Orleans—a great and wonderful beneficence for the use and convenience of man by the Great Architect of the universe.

Had not my engineering experience upon the Mississippi River and its delta drawn my attention to this extremely interesting ancient history of the great river of North America, I might not have been so deeply impressed by its remarkable similarity with that of the Paraná River in South America; and for both histories I am indebted to engineering investigators—Gen. Warren in the first instance, and Col. Geo. Earl Church, an American engineer living in London, in the second instance, the latter probably better acquainted by personal contact with the geography and hydraulics of South America than any living man.

I am indebted to him and the Royal Geographical Society, of which he is a Director and a Vice-President, for most of what follows in relation to this ancient history of the great rivers of Argentine and Central South America.

There are four great breaks in the mountain-fringed continent, and these we call its great commercial doorways. The Orinoco, the Amazon, the La Plata, and the deep indentation of Bahia Blanca—one in Venezuela, one in Brazil, and two in Argentine. The three river basins occupy two-thirds of the entire area of South America.

The two with which we are most interested in this lecture are the La Plata and the Amazon, which have areas respectively of about 1,200,000 square miles and 2,722,000. But if we deduct from the latter the valley of the Tocantins, which has no direct connection with it, the valley of the Amazon is 2,368,000 square miles; its principal branch, the Madeira, has a volume of discharge nearly equal to the Amazon itself, and at the falls, which I shall refer to

later, it carries annually a volume equal to that of the La Plata, which has a minimum flow of about 534,000 cubic feet per second, and a maximum of over 2,000,000—a river 80 per cent. larger than the Mississippi, the Father of Waters, if we compare their mean annual discharges, the former being about 288 cubic miles and the latter 156 cubic miles. The Paraná ("the mother of the sea" in the Indian language), the principal affluent of the La Plata, is itself 46% larger than the Mississippi, its mean annual discharge being about 230 cubic miles.

What a river the La Plata must have been in ancient times, when it had a maximum discharge of 4,000,000 cubic feet per second, well up towards the modern Amazon, estimated to be 5,297,000, and greater than the ancient Amazon!

I have described the ancient conditions of the Mississippi—the Gulf of Mexico as a great estuary, and a deep shore-line extending well into the heart of the North American continent. The same conditions existed in the contour line of South America in the La Plata estuary. It extended 1,400 miles into the continent, and was 400 miles wide—eleven times greater than the Empire State. It was the great Pampean Sea, receiving the drainage not only of the present Paraná and its tributaries, but of the great Madeira River, with its immense discharge of waters and sedimentary matters—the source of great alluvial formations, discharging into a sea two-thirds the size of the Mediterranean.

When, in the processes of nature, the great underwater plains of rich soil had been formed during the comparatively short period of less than 100,000 years, a dam was thrown across the Madeira by the rivers Grande and Parapití coming down from the Andes, and a deposit more than 170 feet deep occurred forming this dam, which produced the ancient Lake Mojos, with an area of about 115,000 square miles—larger than that of the Great Lakes of North America combined, which is less than 94,000.

The remarkable action of these rivers, and the changes caused by it, are graphically told by Col. Church in his paper upon *Argentine Geography and the ancient Pampean Sea.*

> The Grande and the Parapití entered the plain with a northern trend to contest with the great river of the north the possession of the gap. They struck it almost at a right angle, and slowly pushed their rival eastward over against the Chaco base of the Chiquitos sierras. Here the final conflict must have taken place, as the Grande and Parapití threw their dam across the outlet of the Mojos River, thus cutting off its exit into the ancient sea. No doubt the giant stream waged fierce war for thousands of years to keep its channel open, alternately sweeping away the barrier, and again yielding to the ceaseless volume of sand and clay which, visible to-day, con-

firms the victory of the Grande and Parapití. The dam, having finally become permanent, the formation of the ancient Lake Mojos was assured. When it reached the level of the lip of Guajará-mirim, its waters commenced to tumble over it, and carved their way to the Amazon. Since then huge volumes of alluvium have poured down the northern slopes of the Bolivian Andes; the ancient lake is now almost loaded with material, but it is not yet entirely obliterated. The muddy silt which covers the surface of the basin is so fine that, when an Indian goes up stream to the mountains, his friends ask him to bring back a stone that they may see what it is like.

Since forming the dam the Rio Grande has slowly been returning westward down the counter-slope which its own alluvium creates.

During the process we have described the Ancient Lake and tha Pampean Sea were connected, and their relation was similar to that of the Black Sea and the Mediterranean. Traces of it are still observable—notably the great, low, flooded morass of Xarayas on the upper Paraguay River, and the ancient delta of the Paraná, including the Ybará lagoon. The Salina Grande was also an arm of it—a great inland fiord. The sea, moreover, must have covered large areas of Paraguay, Corrientes, Entre Rios, and Uruguay, and, before the uplifting of the country, it extended southwest to the Rivers Chadi-Leofu and the Colorado, lapping round the southern slope of the Ventana range until the curved rim, concave to the northeast, which connects this with the Sierra de Cordova, was sufficiently elevated to cut off completely its southwestern extension.

This range was high enough to lodge the glacial rocks coming from the Andes, one of which, at Tandil, is so poised and delicately balanced that the hand can rock it, but it cannot be dislodged. This range, later, prevented the entrance of the destructive sea, protecting the great area from its waves.

Then came another factor into the beneficent problem of the Creator. Instead of draining the waters from the great deposits under the Pampean Sea, as He did in North America, He lifted the Andes higher, and with them their Atlantic slopes, until the latter were ultimately lifted to their present level, forming the "Plains of the Pampas," the soil of which is 50 feet deep, and of surpassing richness—an area of 600,000 square miles, one-fifth the size of the United States and five times that of Great Britain. Thus, by cyclic changes in the Northern Hemisphere, and by fluvial and sedimentary action, and seismic changes in the Southern Hemisphere, have been formed the great interior agricultural regions of the United States and Argentina.

Let me now quote from Mr. Revy's work on *Hydraulics of Great Rivers* (Argentine rivers which he surveyed), where he compares the rivers as we now find them with others well known:

Great as the volume of the Paraná River at its lowest summer level is, immense

in comparison to the largest European river, and much larger than that of all the European rivers put together, it is but a small fraction of its flood volume during exceptional rises; and we can only wonder at the magnitude of the sources which for months—nay, for whole years together—pour forth inconceivable masses of sweet water, every drop of which had been raised by the power of the sun from the Pacific and Atlantic Oceans above the tops of the highest mountains of Brazil and the Andes.

To convey an idea of the magnitude of the rivers which have been considered and analyzed in the preceding chapters, we have shown on Plate V several of the larger-known rivers, such as the Danube and Thames of Europe, and the Mississippi of North America. They are all drawn to the same scale, and their relative size may somewhat be appreciated. The Mississippi is not unlike the Uruguay in dimensions and other features. We have similarity in width, depth, currents and fall, although the North American is the larger of the two. Comparing, however, the Paraná with the Mississippi, the former might claim the latter as his eccentric daughter under fourteen. The low-water dimensions measure a river's greatness, although things of different natures and character do not bear strict comparison. What we, however, understand by greatness is possessed in an exceptional degree by the Paraná.

In order further to compare the Paraná River with others, it may be stated that its annual flow is double that of the Ganges, three times that of the Saint Lawrence, four times that of the Danube, and five times that of the Nile. We have records of 608 cubic miles in one year.

There are differing conditions of importance between the Paraná and the Mississippi, explaining the causes of the greater discharge of the Paraná. While they both flow south, one flows from colder to warmer and the other from warmer to colder regions; and it is in the warmer regions in both cases that the rainfall is the greater. On the Mississippi, in the northern regions, where we find the greatest drainage area, the rainfall is about 35 inches per annum; in the southern, where the area is less, the rainfall is 60 inches per annum. With the Paraná there is a rainfall of about 60 inches in the northern part, where the drainage area is greater, and about 40 inches in the southern part, where it is less.

The length of the Paraná River is about 3,000 miles; its navigable length, between Cuyabá in the north and the mouth of the Paraná in the delta of the La Plata, is 1,825 miles. The Uruguay River, from San Javier to the delta of the La Plata, has a navigable length of 603 miles. The Paraná River is made up of the two important rivers which unite at the City of Corrientes—the Paraguay and the Alto Paraná. The length of the latter above Corrientes to the falls of the Yguazú is 365 miles, and it is navigable nearly to that point. These wondrous falls excel in beauty, as well as exceed in dimensions, the Niagara Falls.

The latter are 160 feet high, as a maximum, and four-fifths of a

mile long, including Goat Island. The Yguazú are 213 feet high in one leap and 106 feet in two leaps, and 2⅓ miles long, with at times an immense volume of water.

The gorgeous and varicolored foliage of the luxuriant subtropical vegetation, which abounds on all sides, adds a charm to the falls. They rank among the most beautiful and wonderful works of the Creator.

The remolinos, or whirlpools, below the falls equal the famous whirlpool at Niagara.

The Uruguay is an entirely different river in every respect from the Paraná. It is at times a mighty river, rivalling the Paraná; at others it sinks into comparative insignificance. The Paraná is a great river at all times.

The Paraná is a type of a truly great river; the Uruguay represents a mighty torrent of extraordinary dimensions.

The Uruguay rises near the Atlantic seaboard in Brazil, in the Serra do Mar, then runs west to the highland of the territory of Misiones. These highlands prevent it from uniting with the Alto Paraná River at that point, which is only about 68 miles distant. Along 600 miles of its course, from San Javier to Concordia, the bed of the river is filled with rocky ridges, which, at low water, prevent continuous navigation; but during the floods, which are quite sudden, but not long-continued, the river is everywhere navigable. The river rises, in floods, at Concordia about 46 feet. Compared with the Paraná, it is a clear stream, carrying very little sediment in suspension. The Paraná is an entirely different river. Its source being in the tropical and rainy region of Brazil, on the flanks of the Andes, its floods are much longer-continued. At the confluence of the Paraná and the Alto Paraná at Corrientes the rise of the floods is about 33 feet; at Rosario, 225 miles above Buenos Aires, it is from 19.7 to 23 feet, or 23½ feet in extreme floods. When these occur the river is about 23 miles wide, covering the entire country to a depth of from 6 to 10 feet, and extending to the highlands of the Province of Entre Rios.

The physical characteristics of the bed of the river are, consequently, entirely different from those of the Uruguay; the bed of the latter is stable, that of the former very unstable. The sedimentary matters carried in suspension, however, are very much less than those of the Mississippi—probably only one-tenth of the amount carried in the Mississippi in times of flood. For this reason the changes in the bed and banks are less radical; the most noticeable change is the movement of the island and bars down stream. For

example, the Island of Espinillo, in front of the City of Rosario, lying in the middle of the river and about 2½ miles long, has moved, flanking down stream about 2½ miles in the last 50 years, and by this movement the advancing bar of the island has approached the river bank in front of Rosario and closed up the navigation channel.

The maximum velocity in great floods often reaches 6½ feet per second, although usually it is much less—equal to that of the lower Mississippi.

Both rivers are susceptible of improvement by dredging, the Paraná to Asunción, which is 842 miles above the mouth, and the Uruguay to Concordia, which is 230 miles above its mouth. In the Paraná there is nothing but sand to be removed throughout its entire length; in the Uruguay there are several places where it is necessary to remove rock and gravel. But, generally, the channel can be deepened by hydraulic or suction dredging.

The National Government is under obligation, by the law passed by Congress for building the Port of Rosario, to make and maintain a depth of 21 feet at low water in the Paraná River from the head of the delta to Rosario, and in the delta of the La Plata to Buenos Aires a depth of 19 feet at low water, which is about 21 feet at mean high tide. It has been proposed to make and maintain a channel of the following dimensions: From the mouth of the two rivers, at the Island of Martin Garcia, at the head of the La Plata estuary, to Rosario, a depth of 21 feet and a width of 328 feet; Rosario to Santa Fé, 292 miles above Martin Garcia, 19 feet deep and 328 feet wide; Santa Fé to Corrientes, 10 feet deep, and the same depth to Asunción. Santa Fé, or its seaport, Colastiné, is the head of ocean navigation; above that point it is river navigation by steamboats.

On the Uruguay River it is proposed to make a channel 19 feet deep and 328 feet wide, from Martin Garcia to Concepción del Uruguay, 137 miles above Martin Garcia, and thence 15 feet deep to Colon, and 9 feet deep and 8 feet over the rock to Concordia, which is 230 miles above Martin Garcia.

The low-water plane, or zero, in both rivers is that of extraordinary low water, so that, generally, the low water does not reach this plane within about half a metre to one metre. Consequently, there can generally be depended upon from 2 to 3 feet more water than I have stated. Between Rosario and Buenos Aires there is now no bar over which there is not 21 feet of water at zero, although two bars need to be dredged and buoyed in order to make a straightened channel. This the Government is prepared to do.

As to the Port of Rosario a contract has recently been made, under the law of Congress, to make a modern seaport at this point, with all the latest and best facilities for handling cargo. The commerce at Rosario is at present 1½ million tons per annum. It is a very important exporting point for cereals, and when the port is completed according to the plans adopted it is expected to be a great importing port as well. There are ports below Rosario, such as Villa Constitución, San Nicolas, and San Pedro, and above Rosario, Diamante, Santa Fé, Colastiné, and Paraná. On the Uruguay River, Concordia, at the head of the steamboat navigation, is an importing and exporting port for that section of the country. Its registered tonnage is about half a million tons, and the actual weight tonnage about 100,000.

The country between the Paraná and Uruguay rivers is practically isolated from the rest of the country, and its situation is very similar to the country lying between the Euphrates and the Tigris; for that reason it has been called the *Mesopotamia Argentina.*

There are at present in this area three railroad systems—the Argentine North Eastern, which runs from Corrientes, on the Paraná, to Monte Caseros, on the Uruguay, and from there to Santo Tomé, on the same river; the Argentine Eastern from Monte Caseros to Concordia, and the Entre Rios railroads, the main line of which connects Paraná and Concepción del Uruguay, with branches to Victoria, Gualeguay, Gualeguaychú, and Villaguay. Within a few months a connecting line will be completed to Concordia, forming a link between the Argentine Eastern and the Entre Rios systems. It has been proposed to unite these three systems and to extend the Argentine North Eastern from Santo Tomé to Posadas on the Alto Paraná, passing through the colonies which the Government is establishing in that territory. Posadas is its capital. The Central Paraguay Railroad, which runs in a southeasterly direction from Asunción, it is proposed to extend to Villa Encarnación, a small town on the opposite side of the river from Posadas; to change the gauge, which is 5½ feet, to the normal gauge of the other three railroads, which is 4 feet 8½ inches; make a transfer by car float at Pasadas; extend the Entre Rios railroads to a port of deep water, either on the Paraná or Uruguay, and do a "through" business between Asunción and this new seaport, which will be only a few hours distant from Buenos Aires.

With the Paraná River improved to Asunción, and the Uruguay improved to Concordia, with the railway systems united and ex-

tended to a good seaport, this great interior district of the country will have an ideal system of transportation, and the shipper may take his choice, to ship by rail or by water, thus establishing a very useful and reasonable competition between water and railway, to the great advantage of the people.

In reference to the Rio de la Plata itself, it is an immense shoal estuary. It is the depositing-ground of the great Paraná River. This estuary, in a not very remote period, extended above Santa Fé; this is shown by the comparison of old maps, of which 92 have been collected and copied and placed in the library of the Ministry of Public Works. These maps date from the year 1529 to 1885. Even in this comparatively short period remarkable changes are shown in the delta of the Paraná, which is now a true delta, almost exactly in the form of the Greek letter Δ. It is 40 miles across its face; it slowly extends itself in the head of the estuary, and through the delta nearly a dozen outlets of the Paraná River find their way. It is very much like the deltas of the Danube, Ganges, and Mississippi.

The superficial extension of the Rio de la Plata exceeds 18,000 square miles; it is about 186 miles long, and varies in width from 186 miles at the ocean, between Capes San Antonio and Santa Maria, to 1.12 miles at the extreme point of the head of the estuary, at Punta Gorda.

To understand the physical conditions of the estuary, it is necessary to divide the Rio de la Plata into Superior and Inferior, or upper and lower. The Rio de la Plata Superior lies above a line extending between La Plata and Colonia; the Inferior below that line to the sea. Over a distance of about 25 to 30 miles between Martin Garcia and the anchorage of Buenos Aires there is a normal depth through the best channels of from 16 to 20 feet at low water.

The National Government has recently completed the dredging over the San Pedro bar lying in this region, increasing the depth of 18½ feet to 21 feet where there was formerly only 15 feet. In the Canal de las Limetas, or Nuevo Canal, by natural forces and by the constant movement of steamers, there has been obtained a depth of about 19½ feet, or 21½ feet at mean high tide. Opposite Farallon, a rocky point on the Uruguay shore and opposite Buenos Aires, there is, along the course of navigation, about 19½ feet at low water. The Government has buoyed with luminous buoys the entire route from Buenos Aires to the mouths of the Paraná River, the Bravo, and the Guazú, and has placed a floating

semaphore below Martin Garcia for the benefit of navigation, recording constantly by signals by day and by night the depth of water in the channel. It is now proposing to connect this semaphore by a telephone cable with the telegraph cable of Martin Garcia, so that communication may be established between the ships lying at anchor (waiting for the tide, or passing near the semaphore) and the offices of the agents at Buenos Aires or Monte Video.

A careful study of the different conditions in the delta of the La Plata shows that the only method of improvement in such a vast expanse of water is by dredging and buoying the best channels.

In the lower Rio de la Plata there are very serious conditions. A bar on which there is a least depth of 20 feet at low tide lies between the anchorage of Buenos Aires and Monte Video; the material in this bar is very soft, and vessels plough their way through it on ordinary tides; but the great extent of the bar is the serious condition. Between the 24-feet curves, straight through this bar, there is a distance of 24 sea miles. To make a channel by dredging would require the removal of probably 10½ to 13 million cubic yards; and it is very doubtful if, on such broad extension of water and in such soft material, a channel could be maintained. But it is hoped that the plan now proposed of anchoring five lightships in the line of navigation and in the direction of the current, and which can be seen from each other, will have an effect upon the bar by the continued movement of deep steamers through it. The examination of the Rio de la Plata Inferior has been intrusted by the Government to the Ministry of Marine, which is making very extensive surveys and examinations over the entire area.

The estuary at this point is 46 miles wide, and five high towers on shore and others anchored within the area to be surveyed are necessary in order to cover this great Punto Indio bank.

These are the general physical conditions of the Rio de la Plata and its great tributaries.

The very important project of making a deeper channel of access to the Port of Buenos Aires and enlarging the port, to give it not only a greater area and more facilities, but greater depth in the enlarged part, is now before the Government, and the plans for it —made by myself—have been approved. There are alternative projects to meet the commercial necessities of the country: one is to deepen the present Port of La Plata, and endow it with more facilities, where vessels drawing 24 or 25 feet may come in and go

out at any stage of the tide; or to build a deep-water port, with a depth of not less than 30 feet, on the seaboard outside of the difficult conditions of the Rio de la Plata. A concession has been granted, and the project submitted to the National Government, for an artificial port in the great bay of Samborombon, which is nearly opposite Monte Video; and another concession for a port at Mar Chiquita, near Mar del Plata, on the ocean, has also been granted.

In addition to the great drainage basin of the La Plata, there are further south the large rivers Rio Negro and Colorado, which combined have a drainage area of 464,000 square miles. The channels are not susceptible of improvement for a large commerce; but they will in the future furnish water for an extensive irrigation and steamboat navigation.

The hydraulic conditions are great; but the mountains are greater, and have exerted a powerful influence on the continent, not only its climate and its running waters, but upon mankind. On these lofty table lands lived the Incas and flourished their great empires. Among the clouds have fought for supremacy the Incas troops and the Spanish soldiers. And here, too, have the struggles for liberty taken place; here Bolívar and San Martín led their troops to victory and continental freedom from the domination of Spain.

An orographic map of South America will show what immense areas are given up to mountain ranges and lofty summits. In their widest part the Andes are 500 miles in breadth. Some mighty force seems to have pushed them and the entire continental line eastward, and massed the ranges into a complex system of mountains, towering isolated peaks, and parallel, transverse, and interlaced ridges without number. In Bolivia, not far north of the country we are describing, there are thirty-two peaks above 17,000 feet high, some of them reaching over 21,000 feet; and in Argentine is the lofty Aconcagua, lifting its solitary crown to an elevation of 23,080 feet, rivalling the loftiest mountains of the world. And Famatina, in the Argentine Province of Rioja, rises to 20,680 feet, and the grand mountain Tubungato is 22,015 feet high.

Between Argentine and Chile, between latitude 23° and 35°, the mountain passes, which are from 10,000 to 14,000 feet high, are blocked with snow from May to August, and they are swept by violent storms.

The height of the passes, all the way from 7° to 37° south lat., Northern Peru to Southern Argentine, shows the determination of

nature to oppose transit by man, piling up in his pathway these almost insurmountable obstacles. When it is considered that this immense barrier covers a sixth part of the circumference of the globe its influence upon the development of the continent is apparent. The general condition, as far as civilization is concerned and the obstacles in the way of mankind, are forcibly and most interestingly described by Col. Church, comparing them with the conditions in North America:

> The contrast between North and South America is remarkable. Nature was in her kindest mood when she created the former—gave it vast and fertile plains; low and readily transitable mountain ranges; extensive systems of navigable lakes and rivers, the latter not too difficult to bridge; great forests of the most useful timber immense mineral wealth, including an abundance of coal and iron; a coast-line offering numerous excellent harbours easily accessible from the interior, and a temperate, inviting climate over almost its whole area. It is a land where man seems to live with nature on friendly terms, and where the wave of humanity, as it rolls westward, encounters no obstacle which it cannot readily overcome.
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> How opposite to all this is South America! It lies mostly within the tropics; its fertile plains, except those of the Argentine Republic, are difficult of access; it is a formidable task to scale and cross its mountain ranges; its rivers, with rare exceptions, are of violent flow and full of obstacles to navigation, and its largest ones not within the limit of practical engineering to bridge; its vast forests are hard to work and frequently impenetrable; its mineral wealth, immense in nobler metals, includes but little coal and iron; its coast has but few good harbours, and these are almost all mountain-locked; its climate, although in many parts delightful, is uninviting over extensive regions; the forces of nature are so vigorous that man can seldom count upon the unqualified control of them, and, in general, they confer generous reward only upon well-applied and persistent energy.

The above is an introduction to his very important paper read before the Royal Geographical Society, Feb. 25, 1901, entitled "South America: An Outline of its Physical Geography," a paper of 74 printed pages. His conclusions are as follows:

> My analysis shows that, in general, man finds himself confronted by severe conditions in his struggle with nature in South America. Thus far, however, his efforts to develop and utilize its vast resources have made its commercial history an epic. The thought naturally presents itself that had North America fallen to the lot of the Latin race in the European occupation of the New World, and South America to the Anglo-Saxon, the former might still have maintained its old supremacy; for the more rapid progress of the latter may not be due so much to racial superiority as to advantageous geographical surroundings.

Argentine is a country one-third the size of the United States; a climate salubrious and comfortable; of immense plains formed by nature, as I have already shown, for the use of man—plains where the railroads find no natural obstacles worth mentioning in the way of their good alignment and construction; where we have, I think, the longest railroad tangent in the world (186 miles), between Junin

and La Cautiva, on the Pacific Railroad; plains covered with the cattle of the great estancias, thousands of them of the best breeds in one estancia, and sheep by the millions, and great fields of wheat, corn and linseed, the principal agricultural products of the country. An "estancia" might be called a "ranch" on the great plains of our Western States. Their size varies from about three thousand acres to seven hundred thousand acres; probably twenty-five thousand acres might be considered an average size.

As might be expected, the business of cattle-raising requires expert men similar to our cowboys; they are called "gauchos." They are fearless riders and masters of their trade. The horses they ride are generally rather undersized, but wiry and of great endurance. They are much like the best class of Mexican horses.

As the cattle roam over great ranges, which are unfenced, it is necessary to brand them, as we also do on our great plains.

The homes of the gauchos on the estancias are not elegant, to say the least, but in the comparatively mild climate of Argentine they do not need as much protection from the weather as in many of our cattle districts of the Far West. They are a contented people, and while they do not have the facilities for entertainment which a city population has, they nevertheless have their own fun on feast days and whenever their arduous and roaming life will permit.

As might be expected of a country stretching through so many degrees of latitude and rising from the level of the sea to the highest Andes, there is a great variety of climate and generally an abundant rainfall. Buenos Aires is on the same parallel south of the equator as Wilmington, North Carolina, is north of it. Snow is almost unknown, and scarcely ever is ice or frost seen. The climate in the summer is tempered with the great body of water of the River Plate.

The rainfall of Buenos Aires averages 35½ inches per annum—about equal to that of the Northern States of the United States. At Asunción, Paraguay, it is 53 inches—about equal to that of New Orleans. The temperature is remarkably uniform. The mean temperature in June and July, 1899, the coldest months, was 54° (F.), and in January and February, the hottest, 76°; the annual mean being 62°. In twenty years the mean was 63°; summer, 77°; autumn, 65°; winter, 54°, and spring, 63°; mean of January, the warmest month, 79°; of July, the coldest, 52°. The extreme, or extraordinary, limits were 107°, and very rare 104°, frequently 95°, and in winter 23°, which occurred but three or four times. In February, 1900, the heat rose to 103°, but the period of intense heat was only eight days. Such conditions are extremely rare.

The agricultural, industrial, and commercial features are those of greatest interest, and yet to give an adequate idea of them we must take figures.

The population of the whole country is now about 5,000,000; its present rate of growth per decade is about 40 per cent. The United States is 20 per cent., Germany 16 per cent.

The Province or State of Buenos Aires is as large as Illinois, Indiana, Maryland, Connecticut and Massachusetts combined, or two and one-half times as large as New York State—120,000 square miles, and mostly plains, with 750 miles of coast-line. It has 1,200,000 inhabitants, 10,000,000 head of cattle, 80,000,000 sheep, and 2,200,000 horses. In 1901 it raised 762,000 tons of wheat and 1,360,271 tons of corn—a respectable showing; and the value of agricultural and pastoral products was $740,000,000. The wheat area of the Republic, mostly in four provinces—Buenos Aires, Santa Fé, Cordoba, and Entre Rios—is about 8,500,000 acres, and 80,000,000 to 100,000,000 bushels of wheat are exported. The total area under cultivation in the Republic in 1901 was 17,500,000 acres. The increase over 1891 was 136 per cent. The crops were: Wheat, 1,964,000 tons; linseed, 490,000 tons; corn, 2,134,000 tons. The total of arable land is 253,000,000 acres, of which 240,000,000 do not need irrigation.

In the whole Republic there are over 30,000,000 head of cattle. The annual increase is 25 per cent. There are 5,600,000 horses and 120,000,000 sheep (in the United States there are 62,000,000). The annual increase in Argentine is 33 per cent., and 3,000,000 carcasses were sent to Europe in 1901.

One of the important industries of the country is the "saladeros," which from its name signifies salted or jerked beef and extract of beef, etc. Nearly $40,000,000 are invested in them. Brazil is the principal market. Over 1,000,000 head of cattle were killed for the saladeros in 1900. The meat-freezing factories exported 100,000 tons of meat in 1901. An important factor in the Argentine meat trade—and, it may be said, in the meat trade of the world—is the successful result of continued efforts to send chilled meat to Great Britain. The River Plate Fresh Meat Company started this trade in 1901, exporting in that year 29,919 quarters of beef; and from January 1st to May 31, 1902, five months, it exported 38,148 quarters. Since that date the imports into Great Britain have rapidly increased, and recent dispatches from London relate how this factor in the London meat market is alarming the Beef Trust of the United States and the Australian shippers. Argentine is placing its chilled

meat in London at a considerably lower price, and is competing successfully with meat from the United States.

As might be expected, the wool industry is very important, about one-half million bales shipped to Europe, being the export product in the year 1901–1902—31,000 to United States and 28,000 to Great Britain.

Argentine is a protectionist country, and its resources for conducting the Government are largely raised from the Custom dues. In 1899 the imports free of duty amounted to $14,769,933 (gold), and those subject to duty $102,080,738 (gold). The exports were $184,917,531 (gold). The United States imports 300 millions per annum of sugar, hides, linseed, jute, hemp, wood, and fruit, and 36 million of wool and woollen articles. All of these are produced by Argentine; yet only 6 millions of the 336 millions come from Argentine, or two per cent.

The United States exports, including cereals, meat, and live stock, are about 920 millions, and only 10 millions of this go to Argentine, or about one per cent.; while Argentine's purchases of the same articles in England were 39 millions, and 60 millions from other countries.

A volume would be required to take up the subject of the savage tribes alone of America—450 principal groups, and 2,000 if we separate them by dialects. And another volume would be needed to treat of the civilized aborigines of the table lands of Mexico and Peru; of the Toltecs and Aztecs and of Quetzalcoatl and the Incas —the pontifices who ruled over a vast population covering 40 degrees of latitude of South America from Northern Argentine to the Antilles. The barbarism of the savage and the civilization of the races of the table lands have nearly disappeared. You would have no better knowledge of that vast horde of wandering tribes that infested the great plains of the Pampas if I should mention their names. Some few still exist; the census gives less than 20,000 as the total of Indians still existing in Argentine. Once numerous and brave, only about a dozen remain of the Paraquas—the descendants of the Aguas—and of the Tobas and Chinipis, who later occupied their country, a remnant only exists.

It may not be generally known that, from the first arrival of the Spanish adventurers to the successful end of the great struggle for liberty in South America, there was always dissatisfaction, unrest, and hatred of the conquering race. The seeds were sown in bloodshed, in the persecution by the Inquisition, and in false commercial and governing methods of Spain and Portugal, the mother coun-

tries. The difference between North and South America in this respect was very great.

The symptoms of resistance against Spanish domination showed themselves in the dawn of the history of South America. Frequently the Indian tribes attempted to throw off the yoke of some more than usually severe and cruel oppressor. In the early days of the 18th century the revolution of Tupac-Amaru was really a war of races rather than a political revolution, as it had for its principal purpose the extermination of the Spanish. In Venezuela in 1711 this same hatred showed itself in the proclamation of a mulatto as King of the Mestizos. Half a century later the seed sown by Antequera bore fruit in New Granada.

We may say that the struggle and the preparation of the ground for civil and religious liberty began earlier in South America than in North America. In the British Colonies there was no strong sentiment against foreign rule until the imposition of the taxes required to furnish George the Third with revenue to pay off his debt of 148 million pounds sterling. Even Washington, in July, 1775, when he took command of the Continental army, declared that the idea of independence was repugnant to him. Only later did events hasten and make inevitable the separation from the mother country.

It would be a subject of great interest to enter upon—the three great leaders and heroes of American revolutions—

WASHINGTON—BOLÍVAR—SAN MARTÍN,

a triumvirate of liberators.

Of the two former you already know much, possibly, also, of the last; but you may not know that it was by his patriotism and generalship that the whole of southern South America was freed from the yoke of Spain—Argentine, Chile, Peru, and Bolivia. His biography is a romance of most absorbing interest.

Born in 1778, in Argentine, in Japeyú, his early education was in Buenos Aires, completed in Spain. He served with distinction and great bravery in the wars of Spain. Early he was imbued with the doctrine of liberty for his native country; spent a year in Great Britain in 1811 forming associations and a secret league devoted to the liberation of Argentine. Landed in Buenos Aires in 1812; soon in command of a regiment of grenadiers; selected soldier by soldier, officer by officer, imposed the most rigid discipline. Placed in command of the army to reorganize it, he marched to Mendoza, the nearest point to the Andes; and, imbued with the idea that no

liberty would be secure for his country until the Spanish armies were beaten and expelled from Chile, Peru, and Bolivia and the whole of South America, he formed his plans for an invasion of Chile. He was the very incarnation of determined patriotism; nothing, not even revolutions and discord behind him in his own country, could deter him from his great work. At this moment Napoleon fell, and Spain prepared an expedition of 15,000 men destined for the Rio de la Plata. In Chile and Peru the Royalists were victorious; but in Argentine on the 9th day of July, 1816, at Tucuman, the declaration of independence was proclaimed, which, like our own, is sacred in the heart of every Argentine.

In the midst of these great and momentous events, San Martín recruited and drilled and clothed and provisioned his little army destined to conquer a continent, to scale high mountain passes, and pour down upon an enemy largely outnumbering his own. His plans were known only to himself, and when asked by those high in authority what they were, he refused to tell, and said no one should know them; and should his pillow get an idea of his plans, he would cast it into the fire. He ostensibly made roads over certain passes, and, when all was ready, led his army over another and very different pass and came down upon his foe and defeated him in Chacabuco; and again on the plains of Maipú, routing the enemy completely and assuring the independence of Chile. Then, though anarchy was reigning in Argentine and his Government was calling upon him to return, his fixed and irresistible purpose of dealing the final blow to Spanish authority in Peru pushed him forward. With a fleet commanded by Lord Cochrane, and with English and U. S. officers in command of the ships, he sailed from Valparaiso with his troops up the coast in December, 1818. He had only 4,430 men, Argentines and Chileans. The Viceroy of Peru had 23,000 soldiers awaiting this little army. On July 28, 1821, as a result of his campaign, the independence of Peru was proclaimed in Lima and San Martín made dictator. In the meantime General Bolívar, after liberating Venezuela and Colombia, reached Quito, and his forces, united with an Argentine division, routed the Spanish army in the battle of Pichincha.

The two liberators had a conference July 26, 1822, the details of which were kept secret; but it is a well-known fact that San Martín comprehended that, in order to accomplish South American independence and avoid the scandal to the world of a break with Bolívar, caused by the latter's thirst for glory, it would be best for him to depart from a scene where his great presence had no place.

He resigned the dictatorship of Peru; passed to Chile, to Mendoza, to Buenos Aires, to Europe, where he resided four years in Brussels on a very modest pension. Once more, in 1829, he returned to La Plata; but learning that anarchy prevailed in his own country, and deaf to the entreaties of his friends to come to their help, he returned to Europe, saying "No; General San Martín will never spill the blood of his fellow-citizens; he will draw the sword only against the enemies of America." And, without even seeing Buenos Aires, he sailed for the last time to his voluntary exile, dying suddenly August 19, 1850. He was free from those theatrical qualities which appeal to the multitude. In this great character predominated those moral qualities which entitle San Martín to a prominent place in South American history. Inflexible in the discharge of duty, a rigid disciplinarian, everything was subordinated to the high mission to which he had devoted himself, and he never sacrificed his cause to ambitious or personal vain glory. He was the incarnation of an idea. His modesty, his pure and elevated character, the simplicity of his life and the nobility of his principles give him rightfully a position by the side of the great heroes of history.

Reciprocal trade would open the United States to Argentine wool and treble the production in a few years. There should be direct lines to that country from the United States, and the time should be reduced from about 27 days to 15 or 18 days. We should ship to Argentine our manufactures, our coal, pine wood, petroleum, etc., and we should receive from Argentine its wool, hides, grease, dried fruits, hard wood for tanning and dyeing, etc. Now, for want of return freights, steamers load at United States ports for Buenos Aires, and return via Liverpool to New York, frequently via South Africa.

In reference to wool, I have already stated that in the entire United States there are only about 62 million sheep; while there are 120 million in Argentine. It is a well-known fact that the ranges in the Far West of the United States, which are absolutely necessary for sheep-raising, are rapidly being reduced by the extension of our population westward and the cutting up of great areas into smaller farms. Not only do the smaller farmers as they go west wage constant war with the sheep herders, but the cattle-raisers do the same; so that the time is sure to come very soon when we will need the wool of Argentine. What this country should do with a great agricultural country like Argentine, capable of immense productions, is to receive its raw materials and ship to it our manufactured goods.

It is proper in closing this part of the subject to quote a short paragraph which appears in the Argentine Year Book, recently published, from the pen of Mr. Tidblom, Chief of the National Department of Agriculture and Live-Stock Industry. In closing a long article on the Agriculture of Argentine he makes the following statement:

> Nature has undoubtedly endowed Argentina with advantages for agricultural and pastoral farming not to be found in any other country of the world; and it is not too bold a forecast to say that if the country continues to improve her natural gifts in the same degree in which they have been cared for and improved up to the present time the day will come when the Argentine farmers will have absolute control of the world's food markets.

The money of the country is on a paper basis, and the minimum value of a dollar was fixed in 1899 at 44 cents gold, or 127 per cent. premium. The market value of a gold dollar expressed in paper money varies now between $2.27 and $2.34, and the gold dollar of the United States is at a 4 per cent. premium over that of Argentine.

Railways have had an extensive development. In 1867 there were 355 miles; in 1880 there were 1563; in 1890, 5,862; in 1900, 10,601, of which 1,243 belong to the Government and 9,358 to foreign companies. In length of line Argentine stands ninth on the list of countries; but, as compared with the United States, the mileage is about 5 per cent. The paid-up capital is $550,000,000 (gold). The total receipts in 1900 were $40,000,000 (gold). The length of line per one thousand inhabitants is 3.46 kilometres; while it is 4.86 in the United States, 0.93 in Germany, and 1.70 in France.

The great Southern, the Western, and some other lines are still making extensions, and the Southern has crossed the Neuquen River, and is looking for a pass to cross the Andes.

There are three gauges—5 feet (which is really the standard), 4 feet 8½ inches, and a narrow gauge, usually about 3 feet 3 inches.

The total length of telegraph lines is 28,000 miles, of which 12,000 belong to the Government. In the United States the Western Union alone has 192,705 miles of poles and cables.

One of the most interesting railroad lines now in construction is the Transandine, which, upon leaving Mendoza, follows the Mendoza River to its source and climbs to the summit of the Pass of the Andes, 3,900 metres (13,000 feet) above sea-level. The Abt system of adhesion up to 2½ per cent., and then Rack to six per cent. is employed.

Some very interesting views can be had of the approach from the Argentine side. Lofty mountains, rugged slopes, rushing

rivers and the Puente del Inca (the Incas' bridge), a natural bridge formed evidently by the river breaking through a great deposit of cemented material, caused by an avalanche. The railroad is not completed, and some of the most difficult work is yet to be done.

Speaking generally of the railroads, they are well constructed, though good ballast on the great plains is lacking. The cars are like American cars, but the first-class day coaches are much more luxurious than ours. All the long-distance trains have comfortable sleepers; a buffet and dining car goes with all through trains.

In regard to the industries of the country, while the main products are agricultural and the export as well, important industries are slowly developing. While sugar is an agricultural product, the 40 sugar mills may be classed among the industries. In 1870 Argentine imported 22,000 tons, but in 1889 exported 58,000 tons. There are $52,000,000 invested.

There are over 60 breweries in the country. The annual product is about 4,400,000 gallons.

There are 182 distilleries; the alcohol is made principally from corn. The annual product is about 8,000,000 gallons.

Milling is a very important industry. The first steam flour mill was built in Buenos Aires in 1845. In 1895, by the census of that year, there were 659 mills—234 worked by steam and 303 by water; the total amount of flour made was 383,147 tons. The country now exports about 80,000 tons, all in bags and mostly to Brazil, valued at about $3,000,000 (gold). At present the Brazilian market is giving a preference to United States flour because it arrives in barrels, which must lead to the same method in Argentine, although the wood suitable for barrel staves is very limited.

The wine industry is one of the most important. The soil suitable for grapes covers an immense area, extending from the northern to the southern provinces along the slopes of the mountains. Mendoza and San Juan, west of Buenos Aires, are, however, the best adapted to vine-growing. In 1900 there were 89,000 acres in vines, valued at about $10,000,000 (gold). The transportation of the wine by rail in 1901, in Mendoza alone, amounted to 160,000 tons, and the stock of wine in the wine establishments (bodegas) was 33,000,000 litres (8,700,000 gallons).

The dairy industry a few years ago had practically no existence, and nothing at all was done with the milk of the millions of cows in the country. Now large dairies are springing up in all the pastoral parts of the country; the neatest and most tempting places to enter in the city of Buenos Aires are the white-painted, scrupu-

lously clean places for drinking milk, scattered all over the city, the milk being sent in from the great "estancias." These dairies are being built in the most approved style, and they prepare pasteurized, maternized, sterilized, and all other kinds of milk preparations. The exports of butter alone in 1901 were 3,322,391 pounds. In the year 1895 it was only 880,000 pounds.

Iron and steel industries are important, although there is practically no ore or coal in the country. In 1895 there were 154 iron foundries and 156 repair shops, with a capital of $15,000,000. Every class of machinery is now manufactured, even to small engines and boilers.

Matches: the tax alone in 1899 amounted to $2,000,000.

Tobacco: the excise tax on which and its products in 1901 amounted to $4,200,000 (gold).

Four million dollars (gold) are invested in textile manufactures employing 6,200 persons; canvas factories one million (gold) employing 2,000 persons and making 5,000,000 yards, and ten million dollars in hat factories employing 700 hands.

As to mining, there are valuable copper mines containing gold and silver, also rich veins of gold, with recent discoveries of iron ore; but these various products have not been developed to any great extent, due to remoteness from railroads and the roughness of the country, making the exportation very costly. The minerals include gold, borax, copper, marble, silver ore, lead ore, etc.

After these cursory statistics, it is a relief to turn to the beautiful and really great city—Buenos Ayres, and give you a brief outline of its most important characteristics.

Its early history is full of trouble. Founded in 1535, destroyed and rebuilt; and then from 1650, when there were 400 houses, it grew slowly under the old Spanish régime, and later, under dictators and bad rulers, it slowly advanced in spite of an unstable Government. In 1852, when the noted Rosas was turned out, it had 76,000 inhabitants. Chicago was just then passing through the hard trials of a little Western town, and had not more than 20,000 people. In 1864 Buenos Aires had 140,000 inhabitants, and Chicago about the same; in 1869, 178,000. But Chicago had already started on its phenomenal growth and reached over 300,000. In 1887 Buenos Aires had 400,000, and Chicago 1,000,000.

In September, 1902, Buenos Aires had 861,513, and it is growing at the rate of about 40 per cent. per decade. It is destined to reach the million mark by the year 1906. It is now the largest city in the world south of Philadelphia, if we except Chinese cities.

Comparing its present rate of growth per decade with some other cities, we find the following: Greater London, 20 per cent.; New York, 37 per cent.; Chicago, 54 per cent.; Philadelphia, 23 per cent.; Greater Berlin, 19 per cent.; Buenos Aires, 40 per cent.

The city is on the right bank of the River Plate, a sloping bank 50 or 60 feet above the level of water, rising up to considerably greater elevations in the centre of the city. It is about 120 miles from the sea at Monte Video. Its area is one of the greatest in the world, 44,830 acres. Paris has only 19,280; Berlin, 15,625; Hamburg, 15,681; and Vienna, 13,690. It would be a good day's journey to go around the city, as its perimeter measures 39 miles.

As far as the natural conditions permit the streets are laid out in the form of a chessboard, and are generally about 360 feet apart from centre to centre. In the central part of the city the streets are narrow; it is difficult for three carriages to pass. There are, however, a few 33 feet wide, and one or two avenues of about a hundred feet.

The finest, and said to be best-lighted street in the world, is the Avenida de Mayo, which is in the centre of the city as to the numbering of the houses north and south. It has a fine asphalt pavement and double electric lights in the centre. It was cut through the blocks a few years ago from the Casa de Gobierno (Government House), near the port to the 13th street, somewhat less than a mile. At the other end there is being built a beautiful capitol building that will cost about $5,000,000 (gold).

There are 72 parks and small areas outside the main streets, with a combined area of about 1,400 acres. These parks are more tastefully laid out and more neatly kept than can be found in any other country in the world, Paris excepted. In fact, in many respects the city, in its streets, lights, parks and structures, resembles Paris, except that there are more one-story residences than in Paris. The prevailing style is Spanish, with a patio (a kind of open area) and the rooms all facing it, and in this patio a garden and fountain, when the proprietor is able to have it; if not, pots of flowers very much like the ordinary city house in Mexico. The style of the houses of the wealthy may be seen on Avenida Alvear.

The pavements are wood (nearly all hard, suitable wood of the country), asphalt, granite blocks, macadam and rubble. No city has better pavements in the central part. In the outskirts, however, much of the pavement is very bad and uneven, merely rubble; but immense sums are being expended in substituting granite blocks and asphalt for rubble.

There is no city anywhere with more lines of street cars—in fact, with the exception of two streets, there is a line in every one of the principal thoroughfares. And leading out to the pleasant suburban towns—Belgrano, Palermo, and Flores—there are electric lines similar to those in American cities, using the overhead trolley. In fact, all the equipment from rails to trolley comes from the United States. Very extensive changes are being made in all parts of the city, substituting electric for horse cars. There are now 275 miles of street-car lines, which carried, in 1900, 116,447,982 passengers.

There is a project and a national concession for a system of underground electric tram lines, connecting the three main railway stations with the Plaza Victoria, and in one direction extending by a surface line far out in the country. If underground lines pay in any city in the world they will in Buenos Aires, for the conditions are especially adapted to their easy construction, the material being suitable for tunnelling, and a great mass of people crowded into the "Centre," with its narrow streets, where the present surface movement is often extremely congested. A United States citizen has the concession.

In 1868 there was a terrible epidemic of yellow fever, due, in a large part, to unsanitary conditions; but immediately afterward the city began a very extensive system of water and drainage works, costing thirty-three millions of dollars (gold), discharging the sewerage fifteen miles distant, and the storm waters, by great intercepting sewers, now being completed, into the river in front of the city. The city waterworks take their water above the city, where it is never contaminated. These works were designed by Messrs. Bateman and Parsons, of London, and the main construction was carried out under their supervision.

The water of the River Plate is good, but muddy, and it is clarified in settling-basins before being delivered to the distributing reservoir, built on one of the highest points of the city. The distributing reservoir is a work of art, covered with glazed tiles over pressed brick. These works all together have made Buenos Aires one of the healthiest cities in the world, as the death-rate proves.

Ten years ago, upon the completion of the main works, the mortality per 1,000 was 30; now it is 16½. This compares very favorably with other large cities. London has 19.2, Glasgow 21.6, Liverpool 26.3, Manchester 24.1, Dublin 30.4, Paris 20.1, St. Petersburg 24,7, Vienna 20.7, Madrid 30.1, Rome 17.6, Venice 22.8, New York 19.7, Philadelphia 17.7, Brussels 17.9, Boston 19.0, and New Orleans (white) 17.9.

The Government is soon to extend the works at a cost of five millions (gold).

The climate, taking the whole year round, is very equable and very agreeable. The parks are always green; vines and palms and a species of banana plants are seen everywhere, and flowers all the year in the open. It has a semi-tropical country in the north and in Paraguay from which to procure the plants, where the Victoria Regia and other beautiful plants grow wild.

In reference to education the primary education is compulsory from the age of nine to fourteen; secondary education, from fourteen to nineteen, is optional, as also the university, or higher education, from nineteen to twenty-five or twenty-six. No man can enter into any of the professions, including engineering, and take a prominent position in the Government without being a graduate of the National University and having taken the course outlined in the above division of ages.

In 1900 there were 450,000 pupils in the public schools, which are free to all, and free to people of all religions. Although the Catholic religion is the national religion, neither it nor any other religion is allowed to be taught in the schools.

In the National University there are four faculties—law and social science, medicine, exact physical and natural science, and philosophy and letters. In 1901 there were 3,562 students in the University.

In reference to religion all may worship God freely, according to the dictates of their own conscience. While the Government itself, like the Government of Great Britain, Germany, Switzerland, etc., recognizes an established Church and assists in its maintenance, it also often assists in benevolent and educational work undertaken by other denominations.

A very important work of this kind is the Argentine Evangelical Schools, initiated, promoted, and carried on by Mr. William C. Morris. The report of 1901, just issued, shows there were 1,820 pupils in various departments; in the previous year there were 1,076. This school is really a national school, and is assisted in a measure by Congress, although largely dependent upon private subscriptions, which are made to it by not only Protestants but by leading Catholics as well. It is devoted entirely to the education and care of children of the poor who cannot enter the public schools for want of suitable clothing.

The general style of the city is cosmopolitan—in buildings, in stores, in residences, in dress, in habits and customs of the people.

It is made up of many nationalities. According to the census of 1895, there were in the country about 3,000,000 Argentines (all children born there of foreign parents are Argentines) and about 500,000 Italians—by far the largest number of immigrants, and they are far better than the immigrants of the same nationality that come to the United States. Some of the best and most intelligent people in all kinds of business and industries, especially in agriculture, are Italians. Next come the Spaniards, about 200,000; next the French, somewhat less than 100,000; next the English, 22,000; next the Swiss, 15,000; and lastly the North Americans, as we are called, 1,400. These figures refer to the year 1895. The number of foreigners in the country December 31, 1899, was 1,199,808—an increase of 20 per cent. on the returns of the year 1895.

Immigrants in	44 years	.....	1,935,077
Italians	"	"	1,198,550
Spaniards	"	"	361,079
French	"	"	162,636
British	"	"	34,031
Austrians	"	"	31,698
Germans	"	"	27,834
Swiss	"	"	24,873
Belgians	"	"	19,082

The history of the lighting of streets in the city is very interesting, and shows that the city keeps pace with others in this respect. The first record of public lighting was in 1778, when the city had lamps in the shape of a tin of horse-oil with a wick; then came tallow dips, then oil lamps; then came gas in 1885, and in 1888 electricity began to replace it in part; and on December 31st, 1900, the city was lighted with 889 arc lamps, 318 incandescent of 16 cp., 14,084 gas lamps, many with the Welsbach burner, and 8,590 kerosene lamps, and there were 36 electric light stations, with a capital of 9 million dollars (gold), and with a capacity of 23,300 electric horse-power.

In addition to telegraph lines there are four cable companies working with Europe and the United States. The service is very good and prompt; its time of transmission between Buenos Aires and London, "via Galveston" and Western Union lines and cables, is about 60 minutes, and with New York 30 minutes.

It is an interesting fact that the difference in level between the highest point on land of the lines of the Central and South Ameri-

can Telegraph Company and the lowest point of its cables in the Pacific Ocean is about 31,000 feet—six miles.

This company has three underground cables which cross the Andes and work uninterruptedly, though covered with snow for eight months of the year.

The telephone service is in the hands of private companies. The capital invested is over $10,000,000 (gold); there are about 11,000 subscribers. There are no real long-distance lines, except one recently opened to Rosario.

The house-fronts, when kept in repair and painted, are neat and architecturally beautiful. The words "repair" and "painted" must be explained. There are no wooden houses, which these words might imply; they are almost always made of rough brick, covered with what is called *revoque*, a covering of plaster or "staff," and sometimes artificial stone. The better class of houses generally have a base of granite, marble, or other natural stone three or four feet high, and then brick covered with revoque. Sometimes the natural stone extends to the second story, and then invariably comes the artificial covering; after a while—two or three years—this begins to discolor and flake off, requiring painting and repairing; after ten years it begins to become an eyesore, and at the end of twenty years it must come off at considerable expense. An instance to be cited is the American Church, Methodist Episcopal, which was built 25 years ago, but for five or six years past has presented such a dilapidated appearance that it has become necessary to remove the revoque from the sides and front from the base to the steeple and renew it at a cost of $10,000—a large sum for a poor church.

The means of locomotion about the city are abundant—street cars everywhere, and a very good and economical cab service. There are few coupés, no public hansoms, and only one or two private ones; but the street carriages are two-horse victorias, which carry four people. The private turnouts are equal to those of any city of the United States, especially the horses, which are of the best imported stock. The "Corso" and the approaches to it on a Saturday or Sunday afternoon are very attractive. It is in the beautiful park of Palermo, one of the suburbs—broad avenues, beautiful shrubbery, lakes and shady drives, and immediately in front the broad river Plate, whose further shore is beyond the horizon.

The people show great taste in the arrangement of their stores, and particularly the shop windows; from a butcher's shop to a con-

fectioner's and a lace store the fine French taste is visible everywhere. A walk along Florida, the principal shopping street—a fine asphalt street with no street cars in it—is one of the delights of Buenos Aires, and one never tires of it. If for a fortnight you miss this promenade you hardly know the street, for the appearance of the stores has greatly changed in the meantime by a complete change of the decorations.

The manner of living is Continental—a cup of coffee with a roll in the early morning; breakfast at 11 to 12.30 (which is a meal in courses), and dinner at 7.30, the principal meal of the day. This is the custom among all classes, high and low. And there is another custom (it is strange how soon you fall into it): tea or coffee or mate (a species of steeped herb—yerba—pressed into a peculiar little gourd used as a bowl and drawn out of it with a hollow silver tube called a mate stick). This 4 o'clock drink is as necessary as any meal. In the Government House (Casa de Gobierno) the Government provides tea or coffee for all of its officials and employés.

The foreign debt of the National Government in 1900 was $338,771,614 (gold), and the international debt $3,322,500 (gold). There are thirty different loans, the interest on which ranges from 3½ to 6 per cent.; the total interest charge in 1900 was $22,349,900.84 (gold). It requires annually, to pay the interest on the total debt, $18,661,864 (gold) and $11,695,218 (paper).

The total revenue of the Government in 1900 was $62,045,458 paper and $37,998,704 (gold).

It is generally known that in 1890 a terrible financial crash came upon the country, at the time of the Baring failure; since then it has had to struggle to carry the load imposed by the disasters of those days.

Besides Spanish, the national language, French, Italian, English, and German are spoken almost everywhere.

A brief résumé of the ocean commerce will give significant figures.

In 1899 the value in gold of goods imported into Argentine was about $117,000,000, and exported $185,000,000. Of these $44,000,000 imports came from Great Britain and $15,000,000 from the United States; Italy comes next with $14,000,000, and Germany next with $13,000,000; then France with $11,000,000, and Belgium with $9,000,000. But exports show a different distribution, for France took $41,000,000, Germany $29,000,000, Belgium $24,000,000, Great Britain $22,000,000, the United States $8,000,000, and

Italy $5,000,000. Of the foreign trade Buenos Aires had 87.2 per cent. of the imports, Rosario 8.8, La Plata 1.2, and Bahia Blanca 0.80. Of the exports Buenos Aires had 55.5 per cent., Rosario 18.4, La Plata 2.30, and Bahia Blanca 7.00. These ports are mentioned as some information about them is needed to explain the commercial situation. Of all the goods reaching the River Plate countries 80 per cent. comes to Argentine.

In 1885 the National Government began the construction of very large docks at Buenos Aires; hitherto all the business had been done from the anchorage, about 12 miles from the city, the intervening space being a great mud bar, the water from a depth of 25 feet gradually shoaling to the shore-line at the city. This was so flat that it was necessary often to transfer the passengers and goods from the lighters, with which they had come from the vessels, to small boats and to great wheel-carts that went out a long distance in the water to meet the lighters.

The new docks are very extensive, and lie along the immediate front of the city and connected with it; they were designed by the English firm of engineers Hawkshaw and Hayter and carried out under the supervision of Mr. James Dobson, the resident engineer. The concessionaire was an Argentine citizen, Mr. Madero; the contractors were the experienced English firm of Walker & Co., who built the Manchester Ship Canal. These men all deserve the highest credit for carrying through, under the financial difficulties of the period above mentioned, a great public work, costing $38,000,000 (gold).

In order to reach the docks from the sea a channel had to be excavated in the mud foreshore from the anchorage. This channel (the north one) is at low tide 21 feet deep and 330 feet wide, and about 5½ miles long from its intersection with a channel which already existed by previous dredging from the other end of the port, at the mouth of a small, sluggish stream called the Riachuelo, in which channel there generally is about 19 feet of water at low tide. The tide of 2 or 3 feet, depending largely upon the direction and force of the wind and very uncertain, permits vessels drawing about 23½ feet to enter the port by the north channel. The new port was connected with the older port, and now both channels are being used, and the depths in them are about as I have stated.

The Government has recently begun the extension of the north channel straight out to the anchorage, and later will deepen it to 22 feet. In the meantime the navigation uses a crooked channel

beyond the intersection, which has been partly dredged, curving round from the south channel to the anchorage. The depth of water in the northern entrance basin of the port is 21 feet, but in the four great docks 23 feet, with tidal gates so that the vessels at low tide may be afloat.

The works are built in the most substantial manner—masonry walls founded on what is called "tosca" (loess), the hard substratum that is found in this part of the country. The four docks, or basins, are from 620 to 750 yards long, and are all 170 yards wide, connected by passageways 22 to 27 yards wide, over which passes, by hydraulic turning bridges, the foot, vehicular, and rail traffic. A sea wall in front protects the entire port. On the city side are three and four story brick warehouses, 24 in all, with a total frontage of 1½ miles. Sheds, cattle yards, railroad tracks, hydraulic cranes and capstans, and other important appurtenances give the port modern facilities for handling cargo.

When the docks were opened at the southern end in 1899 the registered tonnage of vessels arriving and departing at the Port of Buenos Aires was 3,800,000; in 1901, 8,661,299—more than 100 per cent. increase. There are only twelve ports in the world of greater tonnage, and none of them show such phenomenal growth.

In 1880, about the time that the works were proposed, the tonnage was 644,570, and the plans were made for 2,000,000 tons only.

The extraordinary growth of the commerce has made it necessary to make an enlargement of the facilities, and this was one of the works intrusted to me during the last year of my stay in Argentine. With the proposed enlargement, the port will have free access from the sea and a depth of 26 feet.

The plan also provides facilities for "inflammables"—coal, petroleum, gasoline, naphtha, and some explosives.

The Standard Oil Company of New York is now arranging to bring bulk oil in tank steamers to Argentine, and the Shell Transport Company is preparing to make a specialty of the importation of fuel oil from Texas and the Dutch East Indies. The work of enlargement of the port is divided into sections, so that it can be carried out section by section as the increase of commerce will require. The general plan also includes the protection and deepening of the entrance channels.

One of the principal ports of the country is Rosario. Ocean navigation reaches it, and, for that matter, reaches Colastiné, the

port of the City of Santa Fé, the capital of the Province. The registered tonnage of the port of Rosario in 1899 was 3,000,000, of which more than 2,000,000 were over-sea vessels, about 700 per annum. The merchandise entered and cleared was about 1,650,000 tons; 67 per cent. of the exportation was wheat. In the busy months there are often over 30 vessels seen at one time along the wharves and the barranca, where the wheat is loaded in bags, sliding down from the high cliff 60 feet above the vessel. The imports amount to about $10,000,000 (gold), and the exports to $30,000,000.

The National Government is making a great port of Rosario, endowed with all modern facilities for handling cargo. It sent out to Europe and the United States a full report, with all necessary data, submitting the project to capitalists and contractors, with the request for propositions to build and operate the port. It will cost from $10,000,000 to $12,000,000 (gold).

The contract, after an examination of and report upon the projects presented by a Board of which I had the honor to be President, has been let to the well-known and experienced firm of contractors Messrs. Hersent, of Paris, associated with Schneider and Co., of Creusot, France. The works of construction were inaugurated by the President of the Republic on Oct. 26th, 1902.

The plans of the work have been based on the data above mentioned.

Some important problems had to be solved in connection with the improvement of so great a river as the Paraná, the bed of which is subject to such important changes, and also its islands and banks.

The front line of the proposed wharves is over 2½ miles long. The masonry piers must go down into the tertiary sand below the scour of the river, and their foundations will be from 60 to 80 feet below the low-water level.

The importance of this work, furnishing a modern seaport to the second city of the country, can scarcely be overestimated. In my report on the project made in Sept., 1900, I used the following words, which two years of subsequent study have corroborated:

> It is safe to say that the establishment of a first-class port at Rosario, with suitable channels of access, will revolutionize completely the commerce and industry of this Republic.

La Plata port and city were built by the Provincial Government, when, in about 1880, the National Government came to Buenos Aires to occupy it as the capital of the nation. La Plata is an

excellent port; it is built on the shore of the Rio de la Plata, about 35 miles from Buenos Aires, and cost about $14,000,000 (gold). The opening of the national port at Buenos Aires has driven most of the commerce from La Plata; but it is capable of being made, with a comparatively small sum of money, deep enough, in its entrance channel (five miles long) and in its port areas, to accommodate vessels of 26 feet draught at low tide; it now has 21 feet.

The remaining port of importance and rapidly growing is outside of the River Plate, in the south, Bahia Blanca; it is the principal shipping port of agricultural products by the great Southern Railway, the largest system in the Republic. This port is in an estuary of the ocean, and is a protected harbor; in fact, the terminal of the railway is about 35 miles from the open ocean. The Railway is building a steel pier, 1,640 feet long, with spacious warehouses and 19 miles of siding; and there will be, when all works are completed, over half a mile of wharf frontage, supplied with electric cranes.

The National Government is building in this estuary at Puerto Militar, or Puerto Belgrano, a system of dry docks and basins on a large scale. The first dry dock, one of the best and largest in the world, is completed and now in use. It was designed and built under the immediate supervision of the well-known Italian engineer, Chev. Luigi Luiggi, who had charge of similar work at Genoa.

This dock, built of first-class materials and upon the most modern methods, can take the largest naval or merchant ships of the world, as it has a useful length of 713 feet and an entrance width of 85 feet, and a depth over the sill of 32½ feet at mean high tide, 22 feet at low tide. It has intermediate gates, so that two or three small vessels can be docked at the same time or separately.

The plans, photographs, and possibly a relief model of this dock will be exhibited at the World's Fair in St. Louis in 1904.

In October, 1902, the U. S. battleship Iowa, the flagship of the South Atlantic Squadron, was docked at Puerto Militar.

It is gratifying to know that at Buenos Aires there is a large business with New York by means of five steamship lines, and, through New York, with Chicago and other cities, from which are shipped a large amount of agricultural machinery of all classes—from cultivators and ploughs to great steam threshing machines of the J. I. Case Co., of Racine, Wisconsin. Not only from Chicago but from all manufacturing districts the trade of our country is increasing. You see our machinery everywhere, and it is everywhere considered equal to any—Baldwin locomotives, Jackson and Sharp cars, and Harlan and Hollingsworth's. The American

freight car of 25 and 30 tons is replacing the old Belgian, French, and English 7 and 10-ton cars. If the American cars are not all made in the United States they are copied from ours. The most approved bridges are from the United States. Large quantities of Southern and Oregon pines are imported. From the United States comes all the kerosene used. I might go on enumerating many other United States products. I can well say that the prospects of American trade with Argentine are exceedingly good.

The Argentine Government is determined to improve the great rivers of the country by methods which have been found to be best in other countries under similar conditions. The results of our experience upon the Mississippi are being closely watched, studied, and applied. The reports of the Mississippi River Commission are of great value to that country. I may further say that the Argentine engineers and the methods pursued by them are equal to those of any country. Every Government engineer, to take a prominent position, must have a diploma from the Engineering Department of the National University. The graduates of this excellent school are as well equipped for their work as those from any school in the world; this I know by experience, for four of them (young men) have been associated with me as my immediate assistants, and in my position as consulting engineer of the Government I have been brought into close relations with many other engineers and I have the highest opinion of their ability.

The Sarmiento School commemorates one of the most learned and best of Presidents, who, when he was Minister at Washington, engaged a large number of our young lady teachers to go to Argentine as Normal School teachers. Many of them are there yet after nearly twenty years' service—a service that has reflected honor upon themselves and their country.

In two years of close relations with the country, and especially with the Government officials, I formed a very favorable idea of the character of the people and of the possibilities of business and profitable enterprise for our own people there. The officials of the Government and the leading men of the country desire to have us come to Argentine with business energy, integrity, and ability to help build up that great country of South America, so like our own in its climate, soil, rivers, coast-line, and other general features.

THE CITY OF ROCKS.

BY

U. FRANCIS DUFF.

A remarkable natural curiosity of the Southwest is the "City" of Rocks, near Hudson Hot Springs, in southern New Mexico. Here, rising from a ridge of solid rock, and extending over about two hundred acres, is a great mass of lofty domes, crags, columns, peaks, shafts, spires, and pinnacles, through which run many openings and passageways, corresponding in a certain degree to the avenues, streets, and closes of a town. From the main passageways hundreds of little alleys, many so narrow that one is put to it to squeeze through them, branch in all directions. These are so numerous, intricate, and winding in their confusing mazes that it would require considerable time for one to familiarize himself with them. All of this is interspersed with little plazas, or open courts; while on the outer edges are several semi-circular and triangular bays, which extend up into it from the surrounding plain.

It is evident that a long ridge of rock extending the length of the place was forced up here at some time in the bygone ages—a past so remote as to be beyond conjecture. This rock was a formation of different degrees of hardness, the portion in contact with the seams, or veins, running lengthwise and across it having been so much less refractory than the rest as to have been worn away in the course of the long cycles of time that have rolled by, or, it may be, because the elements could more easily reach these parts.

It is possible that the glacial period has been a factor in the work; but it is more than likely that the slow but sure disintegrating processes of time—the wind and the rain and the continuous chemical action of the atmosphere—have produced this most remarkable formation, second in grandeur and interest, so far as I know, only to the Garden of the Gods in Colorado. In some respects it is even more striking than the latter, the mass being so much greater.

The domes and towers shoot up in many places to a height of from fifty to sixty feet. Very few of these have sharp points or edges, the material of which they are composed being of such a nature—so easily affected by the elements—that the outlines have been worn away and softened down. Nor does this detract from

their picturesqueness and impressiveness. All are more or less honeycombed, and the wearing-away process still continues. From cells whose cups extended some distance into the rock I took out handfuls of the more friable material which had once filled them.

Sphinx-like and immutable they stand, the sentinels of the centuries, keeping watch and ward as the seasons have come and gone in this dun land of the wide horizon with its ineffable haze. The warm sunlight shimmers down upon them, bathing the lofty cones in its tender radiance; the little winds creep up, whispering across the wastes; but out of the brooding loneliness comes no voice to tell their story.

That the "City" was known to the Indians in prehistoric times is evident by the remains found within its limits. From a mass of

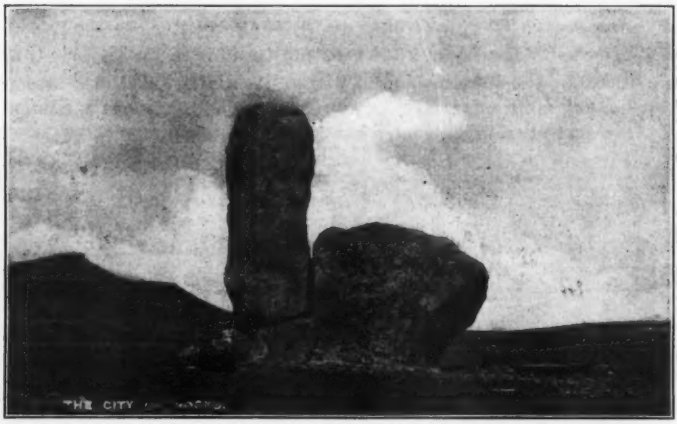
EAGLE CRAG IN THE DISTANCE.

débris covering the bottom of a dark cavern formed by the falling together of three great peaks was exhumed a number of relics and a skeleton in a fairly good state of preservation. Just outside of this cavern mortars have been cut in the main ledge. On a bench, in a great cavity hollowed out of one side of Aztec Rock, a body had been laid away and enclosed with a substantial wall composed of flat stones set in adobe mortar. This had been opened and the remains carried off some years prior to my visit, but a portion of the wall is still standing.

The streets stretch away, in many cases, in almost perfect line, although the view is more frequently interrupted by sharp turns

and windings. These generally trend north and south or east and west. Some of them are fifteen or twenty feet wide.

The rocks have assumed many curious and fantastic shapes. The Leaning Tower, Balance Rock, the Cardinal's Hat, and another, something like a kneeling camel in appearance, are very striking. Two little pinnacles on the west side, known as Twin Pillars, are also quite interesting. At the northwest corner is a massive dome called Eagle Crag, in a large pocket of which a pair of eagles have nested for several seasons and successfully reared their broods.



CAMEL ROCK.

To attempt a description of all of the attractive features of the "City" would be a task requiring a perfect familiarity with it—something that could only be obtained through long and careful investigation.

The visitor will find, at every step, something new to attract his attention; a score of openings, leading in as many different directions, will invite him, until, bewildered, he finally sits down to rest and gather together his scattered wits.

Some idea of the confusing magnitude of the place may be obtained from the fact that the writer spent more than an hour trying to find Aztec Rock, which he had visited the day before, and the general location of which he had quite distinctly in mind. Providing one has a very sure-footed animal, it is possible to ride a horse over most of the "City," although swinging around the edges of great crags and climbing steep inclines are apt to be a little trying on the nerves.

A man named Couch has filed a homestead claim on one hundred and sixty acres of the site; but owing to its remoteness, it will not be of great advantage to him, even should he fence it in, as I understood he contemplates doing. If possible, it should be set apart by the Government.

THE ISLAND OF GUAM.

This map of the Island of Guam is reduced from the map published by the War Department, the result of the Government

GUAM.

survey. The facts here given with regard to the island are taken from Brig.-Gen. Joseph Wheeler's report on Guam, published by

the War Department, and the article by Mr. W. E. Safford in the last report of the Smithsonian Institution. These reports embody the best and latest information that American investigations have made accessible.

The island is twenty-nine miles long and from three to ten miles wide, with an area of about 150 square miles, or seven times as large as Manhattan Island. It is four days' steaming to the east of the Philippines. Little is known about the interior; for the jungle is so dense that not even the natives have penetrated far into it, except in two or three places, where paths extend from coast to coast. A fine view of the northern third of the island is obtained from the summit of the low mountain, Santa Rosa peak, which is easily reached. All the inhabitants live along the coasts, and most of them along the west coast. The natives have cleared away a narrow strip of the jungle, bordering the sea, for their plantations.

A chain of low mountains, scarcely over 1,000 feet high, stretches along the southwest and south coasts, some twelve miles, and from two to three miles in the interior. Guam, like all the other islands of the Ladrones, of which it is the southern and the largest member, was built up partly by outpourings from volcanoes and partly by the work of coral insects. It has this advantage over the islands to the north, that its volcanoes are all extinct; while there are still eruptive mountains on some of the more northern islands. Guam is, however, subject to severe earthquakes.

The northern half of Guam consists almost wholly of coral rock, which is very porous, so that the rain sinks immediately into it, and makes its way by underground channels to the sea; thus there are no springs or rivers in the northern part of the island. Near Agaña, the capital, however, is a large spring, yielding a copious water supply, which oozes through a swamp and widens into a river. Near the sea it has been artificially lengthened and turned for a mile, parallel to the coast, for the convenience of the natives. This is one of the reasons why two-thirds of the population is centred at Agaña. Some of the streams in the southern part of Guam lose themselves beneath the surface for a time, and then reappear from limestone caverns.

Nearly all the inhabitants, though farmers, live in the towns, and go out to their ranchos to raise their crops. Most of the entire population of about 9,000 is distributed among six towns: Agaña, containing 6,400 inhabitants; Sumai, 900; Ynarajan, 550; Agate, 400; Merizo, 300; and Umata, 200. A number of hamlets, each containing a few huts, are also distributed along the shores.

SURVEY OF THE UNITED STATES.

Agaña, the metropolis of the island, achieved its pre-eminence by reason of its abundant water supply, although there is only a roadstead in front of it, with unsafe anchorage. San Luis d'Apra is the largest harbour of the island, with a number of small towns along its extensive shores. Port Tarofofo, on the southeast coast, is the only harbour next to San Luis which can receive vessels at all seasons of the year. Port Ynarajan and Agfayan Bay have good anchorage, and are of some importance in the coprá trade. Umata was once important commercially; but, since its destruction by an earthquake in 1849, Agaña has forged far ahead of it.

The towns of the west coast are connected by paths or roads. The road from Agaña to the north passes through an especially fertile country; and there are two passageways across the island—a fairly good road from Agaña to Pago and a poor path from Apra, diagonally across to Ynarajan.

The gentle Chamorros, the aboriginal inhabitants, have heartily welcomed the advent of the Americans. They are lighter in colour than the Filipinos, fully clad, subject to few diseases, and cheerful in disposition. They procure their food from the farms or the sea, live in very well-built houses, many of them of stone, and manufacture at home most of the things they need. Many of them are half-breeds, their fathers being American and British whalers, whose visits are now very rare. The influence of the Roman Catholic missionaries, who have lived among them for generations, has been favourable; and the Caroline Islanders, about 100 of whom came to the island as farm labourers and now till their own little farms, are far behind the natives of Guam in civilization.

TOPOGRAPHIC SURVEY OF THE UNITED STATES.

During the twenty-three years' existence of the Geological Survey it has mapped thirty-two per cent. of the area of the United States, exclusive of Alaska; or, in other words, there have been mapped to date 967,000 square miles of the country, on scales ranging from four miles to an inch, two miles to an inch, and one mile to an inch, up to large-scale detailed surveys for special areas.

During the past season there were in the field over ninety separate parties. These were working in thirty-four different States and Territories, including Alaska, and comprised a force which included eighty-two topographers, ten other party chiefs, and about

three hundred temporary assistants. This force mapped, in round numbers, 20,000 square miles, on the scale of about two miles to an inch, with relief, shown by contours, having intervals varying between twenty and one hundred feet; and 17,000 square miles on the scale of one mile or larger.

While nearly one-third of the area of the country has been mapped, the progress is apparently at the rate of but one per cent. of the country per annum, at which rate it would require nearly eighty years yet to complete the map of the United States. On the other hand, the absolute amount of work accomplished is great; for thirty-seven thousand square miles make an area as great as that of Indiana, or of South Carolina and Connecticut together. As compared with the areas of European countries, it would be equivalent to mapping annually Portugal, or Belgium, Denmark, and the Netherlands combined.

During the year the results in the more important sections of the country were as follows: In Maine, 215 square miles were mapped on the upper Kennebec, and a complete topographic survey, accompanied by careful spirit levels, was made of the entire Kennebec River to the Moosehead Lake outlet. In New Hampshire an equal area was mapped in the neighbourhood of Manchester and Nashua; in Vermont, a like area between Middlebury and Vergennes.

In New York over 2,500 square miles were mapped, chiefly in the Adirondacks, Western New York, the Catskills, and on Long Island, where the entire survey was completed, and the results will soon be engraved for final publication. In the neighbourhood of Plainfield, Morristown, Somerville, and High Bridge, New Jersey, the old State survey maps were revised to bring the culture, such as roads, houses, etc., up to date over an area of about 800 square miles.

In Pennsylvania an area approximating 800 square miles was mapped in the neighbourhood of Johnstown and in and about Pittsburg. The latter map was made on the large scale of two thousand feet to one inch, which permitted of showing every house, factory and other building, street and trolley lines, and resulted in the completion of the first connected map of that region. In Ohio about 3,000 square miles were completed, including particularly areas about Ashtabula, Akron, Kent, Marion, Hamilton, Athens, etc. In West Virginia an area of 1,800 square miles was mapped, chiefly in the northwestern portion of the State, including the region in which coal, oil, and other mineral resources are being developed.

In North Carolina and Georgia surveying was extended in each case over about 600 square miles. In Tennessee nearly 1,000 square miles were mapped southwest of Nashville; and in Kentucky an equal area in the Blue Grass country south of Lexington and in the mountains near Middleboro. In Louisiana an area of nearly 1,000 square miles is still under survey immediately north of Baton Rouge.

In the Central States about 500 square miles were mapped in Indiana near Evansville and in Iowa near Decorah; in Wisconsin, about 500 square miles near Richland Center, and an equal area near Racine and Koshkonong; in Michigan, 800 square miles between Ann Arbor and Detroit. About Independence, Kansas, about 1,000 square miles were mapped, and 300 square miles in the neighbourhood of Bonne Terre, Missouri. In Arkansas 500 square miles were mapped immediately west of Eureka Springs. A resurvey on the large scale of 2,000 feet to an inch was completed of an area of 500 square miles about the city of St. Louis. The publication of this is to be pushed with all vigour, with a view to completing it in time for printing and distribution at the World's Fair in 1904.

In the Far West a large amount of work was in progress in the vicinity of Circle City and the Nome peninsula, Alaska. In Arizona detailed mapping of a portion of the Grand Cañon of the Colorado is in progress, besides the survey of about 250 square miles near Tucson and of 1,000 square miles near Nogales. In Colorado topographic surveying of 150 square miles was completed near Georgetown, and large-scale special maps for the study of mineral resources were made in the neighbourhood of Cripple Creek and Lake City. In Utah 100 square miles were mapped in the Uinta Mountains, and a large-scale special map made near Cottonwood, on the summit of the Wasatch Mountains. In Texas an area of 500 square miles was mapped in the Chicos Mountains. In Montana about 300 square miles were mapped in Flatwillow County. In Wyoming in the neighbourhood of Laramie and Sherman there was mapped an area of about 1,300 square miles. In Oregon about 500 square miles of Union County were completely surveyed. In Washington the survey was in progress, or was completed, of about 2,600 square miles in the neighbourhood of Mt. Adams, Chapaca, Oakdale, and Okanogan.

In the State of California there were mapped about 1,500 square miles in Santa Barbara, San Luis Obispo, Tulare, and Fresno Counties. In this State there were also made special large-scale sur-

veys for study of mineral resources in Shasta County, about Bully Hill and Little Backbone. Mapping in the Sacramento and San Joaquin valleys will be continued throughout the larger part of the winter.

No unusual topographic features or unknown regions were developed by the surveys of the past season. Some interesting forms were mapped, and facts of interest to the geographer and the geologist will be made evident by the resulting atlases, notably in the detailed surveys about Bright Angel, the tourists' region of the Grand Cañon of the Colorado. The intricate forms resulting from the erosion of this gorge are beautifully portrayed on the map, and give quite a different idea of the topography as compared with that in the earlier exploratory maps.

Of almost equal interest are the maps of the southern shore of Lake Erie and about Detroit, because of the light they throw on the various stages of the Great Lakes as depicted in the outlines of the old beaches.

The map of the vicinity of Pittsburg is one of the most interesting ever made. The topography shows a highly-eroded plateau, and the various rivers are bordered by steep bluffs, upon the sides and slopes of which have been built a series of cities which for density of habitation and congestion of streets, buildings, and railroads is hardly paralleled anywhere, when the abruptness of the mountain slopes is taken into consideration.

In addition to the topographic mapping described a large amount of geodetic control, both by primary triangulation and primary traverse, was extended throughout various unmapped areas of the country. This is to serve as a basis upon which to develop topographic surveying. It consisted in determining by geodetic methods the astronomic positions of important points, as mountain summits, church spires, etc.

In the East a belt of triangulation was extended from near Burlington, Vermont, to the Canadian line. In New York primary traverse was run to control scattered areas between Rochester and Buffalo and east of Oswego. In Pennsylvania similar control was extended to the eastward of Philadelphia and in the northwestern corner of the State. In Ohio similar control was extended along the western State boundary throughout half its length to the northwestern corner of the State, as well as scattered areas elsewhere. In West Virginia primary triangulation was extended between Charleston and Elizabeth. In Kentucky primary traverse was extended southeast of Owensville; in North Dakota, over

an area of about 2,000 square miles between Fargo and Grand Forks.

In the western United States more extensive areas were controlled by primary triangulation. In Montana a belt of triangulation was extended down the Milk River for over 100 miles from Fort Assinniboine. In Wyoming a belt was extended across the State from north to south between the neighbourhoods of Laramie and Buffalo; in eastern Washington, from North Yakima through Yakima, Douglas, and Kittitas Counties to the international boundary. In eastern and central Oregon large areas were similarly controlled in Grant, Harney, and Malheur Counties, and in the famous Modoc lava-beds country. In Arizona a belt of triangulation was extended from the neighbourhood of Florence, *via* Tucson, to the Mexican boundary near Nogales.

Throughout the various regions in which topographic mapping was in progress there were run about 17,000 miles of very accurate primary levels, and 25,000 linear miles of secondary levels of less accuracy, for the location of contour lines upon the topographic maps. Some precise levelling was extended near the Pacific coast in the upper Sacramento valley, with a view to reducing the spirit-levelling to mean sea-level datum. In connection with all this spirit-levelling many thousands of bench-marks were established, which will serve as reference points for engineers and others who may have to make use of careful levels in connection with their work.

H. M. W.

THE PANAMA CANAL IN ITS COMMERCIAL ASPECTS.

BY

EMORY R. JOHNSON.

As the beginning of the actual work of constructing an Isthmian canal seems to be close at hand, the present is an opportune time for making a careful study of the commercial aspects of the great waterway. The purpose of the present paper is to consider the effects which the canal will have on commercial routes and the volume of traffic that will make use of the waterway at the commencement and during the early years of its operation.

The use that will be made of the canal will depend upon the

economies resulting from the opening of the new route. The saving that will be possible consists to a small extent of a reduction in insurance charges. A considerable share of the traffic that will be diverted to the new route now passes through the Straits of Magellan by steamers, or around Cape Horn in sailing vessels. Just how great a reduction in insurance costs will take place is impossible to predict, but estimates of a saving of 25% to 50% have been made by those engaged in insurance business.

The greater efficiency which shipping will possess because of the shorter and more expeditious route will be an advantage the amount of which cannot be fully measured by the economies resulting from lower insurance charges or by the shortening of distances, to which reference will presently be made. To a considerable extent ships are operated as a part of business enterprises, and the fact that a vessel can make more trips and handle more tonnage in a year not only reduces the amount of capital that must necessarily be invested by a business concern, but also enables the business in question to be carried on under more favourable circumstances. When there is a large surplus of vessels seeking employment this advantage is not important; but when there is a scarcity of shipping, as not infrequently occurs, the ability to make voyages quickly and to handle a large amount of traffic with a relatively small tonnage of vessels is of much importance.

The most important saving effected by the canal will result in the shortening of distances. This economy, however, will be in part offset (1) by the delay incidental to passing through the canal, (2) by the tolls charged for using the waterway.

The time required for making the transit from the Caribbean Sea to the Bay of Panama by way of the Panama Canal will average about 12 hours. Small ships can make the trip in less time; while the largest vessels will take somewhat more than twelve hours for the trip between Colon and Panama. Any vessel arriving at either terminus early in the morning can make the passage through the canal during daylight of the day of arrival. A vessel arriving in the evening or during the night can also proceed on its trip through the canal, provided the canal is thoroughly lighted, as it presumably will be. It is probable, however, that vessels of the largest size will prefer to wait a few hours in order to make the passage by daylight. On the average, a vessel will be detained somewhat less than a day, including the passage through the canal.

The question of tolls and their influence on traffic can best be considered in connection with a discussion of distances. A care-

ful study of the effect of tolls upon the traffic of the American waterway indicates very clearly that the charges must be placed much lower than the Suez tolls. The charges at Suez are 8.50 francs per ton net register, Danube measurement; but as this measurement makes the net registry of vessels average about 20% more than when measured according to British or American rules, the charge for using the Suez Canal amounts to about $2 per ton net register, according to our methods of determining tonnage. For some of the traffic available for the American canal such a charge would be prohibitive.

The saving in distances that will result from the opening of the Panama Canal was fully set forth in the BULLETIN of last April. The facts there presented make possible the determination of the territorial limits within which the Panama Canal will be able to draw its traffic, and enable a statement to be made of the amount of tonnage which the commerce within those limits may be expected to send through the waterway. The effect of the canal upon the diversion of traffic may be indicated by considering the subject under six heads:

1. The commerce of the western seaboard of the United States —including Hawaii—with the Gulf and Atlantic ports of the United States and with Europe may be considered as certain to use the new canal route. The shortening of the distance will be so great as to leave no doubt of the diversion of traffic from existing lines to the new route even were the tolls placed as high as those charged at Suez.

2. The commerce of Western South America with the Gulf and Atlantic sections of the United States will also be entirely diverted through the Panama Canal. The distance from New York through the canal to a port as far south as Valparaiso will be 3,850 miles, or 45%, less by way of Panama than *via* the Straits of Magellan; and between the ports of our coasts south of New York and the cities on the west side of South America north of Valparaiso the absolute and percentage reduction in distance will be much greater. Here, likewise, a toll of as much as $2 per ton might be charged without keeping the traffic away from the new route.

3. The commerce between the eastern seaboard of the United States and the Asiatic ports north of Hong Kong will be practically certain to make use of the Panama route, provided the tolls are not made exorbitant. The distance to Shanghai *via* Panama will be 2,000 miles less than by Suez. From New York to Yokohama the new route will save 4,000 miles.

4. The effect of the Panama Canal upon the traffic between Europe and Western South America merits especially careful consideration in connection with the effects of tolls. The influence of the proposed route upon commerce can be measured to advantage by referring to the nitrate of soda exports from Northern Chile. Three-fourths of the Chilean export tonnage consists of nitrate, the deposits of which are located in the middle part of the western coast of South America. The average distance from the ports of Northern Europe—Antwerp, Hamburg, Liverpool—to the nitrate deposits will be shortened about 2,800 nautical miles. The present distance by way of the Straits of Magellan will be reduced about 30%. A saving of this distance would shorten the time of the voyage for a 10-knot steamer 11 days 16 hours. As the passage through the canal will detain the vessels somewhat less than a day, it may be said that the Panama Canal will reduce the trip for steamers between Europe and the nitrate beds about 11 days. A vessel operated at a speed of 9 knots an hour (which is the present speed of a large share of the tramp steamers) would shorten the time of the voyage nearly 13 days. Careful calculations of the net economy resulting from a reduction of 11 to 13 days in the time of making voyages between Europe and the central ports of South America indicate that it would be profitable for steamers to abandon the present route by the Straits of Magellan in favour of the Panama route. At the present time the largest part of the nitrate is carried in sailing vessels whose route is around Cape Horn. It is, however, not probable that a very large percentage of this traffic can be economically handled by sailing vessels by this circuitous route after the canal becomes available for steamers, provided a toll of not more than $1 per ton net register is charged for the use of the canal. A higher charge than this would doubtless cause many steamers to hold to the present Straits of Magellan route, and sailing vessels to continue to compete indefinitely with steamers for this bulky traffic.

5. The commerce between the eastern seaboard of the United States and Australia now goes around the Cape of Good Hope. The distance by the Suez and Cape routes is practically the same; consequently, when the American canal is opened the competition for the New York–Australia trade will be between the Isthmian Canal and the Cape of Good Hope routes. The distance from New York to Sydney *via* the Panama Canal and Tahiti will be 9,852 nautical miles; by the Cape of Good Hope, Adelaide, and Melbourne the distance to Sydney is 13,658 miles, the distance in

favour of the American isthmus being 3,806 miles. A 10-knot vessel would save about 15 days by taking the American canal route, and certainly would prefer that passage if tolls did not exceed $1 per ton net register. Practically, all vessels going to Australia, whether from Europe or the United States, call at Sydney because it is the most important port, and because coal can be obtained there or near by. For the trip from New York to Melbourne the Panama route would save about 11 days, and a toll of $1 could profitably be paid to accomplish this. There is, then, no doubt that steamers outbound from the Eastern section of the United States to Australia will prefer the American canal route with a toll of $1. The course taken by the vessels on their return will naturally be determined by the destination of the Australian exports. The ships that secure a whole cargo for America will return by the American canal. Likewise, those vessels that secure a partial cargo for the United States and a partial cargo for Europe will return by the Panama Canal. Steamers securing a full cargo for Europe in Australian ports will probably return by the Cape of Good Hope, although cheaper coal in American stations might cause the American canal to be used. The distance from Sydney to Liverpool by way of the American canal is only about 200 miles longer than the route by way of Melbourne, Adelaide, King George's Sound, Colombo, Adelaide, and the Suez Canal.

6. The effect of the Panama Canal upon the routes followed by the trade of our eastern seaboard with the Philippines will depend very largely upon the amount of tolls charged. Low tolls will divert a considerable share of the traffic from the Suez route to the one across the Isthmus of Panama. The distances from New York to Manila by the two canals are practically the same. From our South Atlantic and Gulf ports the distance to Manila is considerably less by the Panama route. Chartered vessels outbound from New York will doubtless go sometimes by one route and sometimes by the other. The chief attraction of the American route will be the coasting trade of both seaboards of the United States, the shortest route from the American isthmus to Manila being by way of the great circle which passes close to San Francisco. It will accordingly be possible for vessels sailing under the American flag to follow the course of the heaviest traffic movements—*i. e.*, to load with heavy manufactures or with other cargoes from the Atlantic or Gulf ports for the western ports of the United States; thence to take American grain and other food-products and manufactures to the Orient and the Philippines, and to load back for the United

States with hemp or other cargoes from the East. The coal obtainable in the Caribbean and Japanese stations will be inexpensive, and the American canal will have special facilities for competing with the Suez Canal, particularly if the American canal tolls are made less, as they unquestionably will be, than those charged by the Suez Canal Company. The Philippine Islands are so nearly antipodal to the eastern seaboard of the United States that the route taken by the commerce between the two sections will be determined almost entirely by the relative rates of tolls prevailing at the two waterways.

In view of the fact that the largest part of the Suez traffic can afford to pay a high toll rather than abandon that route, it is not probable that the Suez Canal Company will find it profitable to make a radical reduction in its charges—50%, for instance—in order to hold the commerce of the regions situated on the margin of advantage as regards the use of the eastern or western canal routes. Consequently, it would seem that the adoption of moderate tolls—not to exceed $1 per ton net register, American measurement—for the use of the American canal will enable that waterway to secure a large share of the commerce carried on between sections so situated that their trade with each other can choose between the Suez and American routes.

In general, it may be said that there is but little of the available Panama Canal traffic that would be kept from using the waterway by a toll of $1 per ton net register. The European trade with Western South America and the commerce of our eastern seaboard with Australia and Asia north of Hong Kong will not be driven from our canal by a toll of that amount, but it seems probable that a higher charge than $1 a net register ton would considerably restrict the other categories of traffic discussed in the foregoing paragraphs. A toll that largely restricted the traffic of the canal would limit the industrial and commercial value of the new route and deprive our country of many benefits it would otherwise secure. A toll of $1 a vessel ton net register would yield an income sufficient to pay the expenses of operation and maintenance and a moderate return on the capital invested, as the following statement of tonnage will show. Should the United States prefer to levy tolls sufficient only to cover the costs of operation and maintenance a tariff of 40 cents or 50 cents a ton will undoubtedly be sufficient.

The Tonnage of Canal Traffic.

In 1900 and 1901 the writer, while serving as a member of the Isthmian Canal Commission, made a detailed investigation to deter-

mine the traffic available for the canal during the year 1899, the latest year for which statistical material was available. Two investigations were made—one to determine the tonnage of freight or cargoes that would have used the canal during 1899, and the other to ascertain the net register tonnage of vessels that would have passed the canal during that year.

In the study of *cargo* tonnage special difficulties were encountered, because the available statistics compiled and published by the United States and other Governments do not give the weight of commodities exported and imported. In the case of our own statistics values are given for each of 328 classes of exports and 333 classes of imports. In some instances quantities as well as values are stated; but the weight corresponding either with values or quantities had to be determined by correspondence with exporters and importers in different parts of the United States. The conversion of the figures for values and quantities into their accurate equivalents in weight or tonnage was a laborious undertaking, which, however, was carried through with great thoroughness and detail.

It was found that the traffic of the two seaboards of the United States with each other and with the sections of the world with which our commerce would have unquestionably been carried on through a canal, had there been one in existence, amounted to 3,435,887 cargo tons in 1889. The value of this traffic was $127,716,000. The commerce of Europe with the western coast of Central and South America, with Hawaii and British Columbia, in 1899, comprised 3,266,654 cargo tons. The sum of these two totals is 6,702,541 tons. These figures do not comprise any commerce between Europe and the western coast of Mexico; nor do they include any of the trade between Europe and Eastern countries, a part of which would, for reasons stated above, have passed through the American canal. It will be understood, moreover, that the figures apply to the commerce of the past carried on under conditions then prevailing. They do not refer to the commerce of the future, which, when the canal is opened, will be carried on under very different circumstances.

The tonnage of the *vessels* that would have used a canal in 1899 was ascertained by a study of the statistics of entrances and clearances compiled by the United States and European countries. Unexpected difficulties were encountered in this inquiry, arising from the fact that different countries follow different rules in the compilation of entrance and clearance statistics, and also because it

was necessary to be on one's guard against duplication. Great care was taken to avoid this, and to make certain that the statistics should err, if at all, on the side of under-statement rather than of exaggeration.

The following table summarizes the vessel tonnage which the commerce of America and of Europe with America might have contributed to a canal in 1899:

SUMMARY OF ENTRANCES AND CLEARANCES, COMMERCE OF EUROPE WITH PACIFIC AMERICA, AND COMMERCE OF EASTERN SEABOARD OF THE UNITED STATES WITH PACIFIC COUNTRIES, 1899.

Europe with	
Western South America	1,771,853
Western Central America and Mexico	140,000
Pacific Coast of United States, British Columbia, and Hawaii	642,180
Eastern Seaboard of United States with	
Western South America and Hawaii	166,364
Pacific Coast of the United States	109,312
Trans-Pacific Countries	908,140
Panama Traffic (1898)	336,998
Total	4,074,852

In addition to this tonnage, which comprises only traffic originating or terminating in America, there should be included most of the commerce of Europe with New Zealand and the other islands of the Pacific east of Australia. New Zealand will be about 1,500 miles nearer Liverpool by the Panama Canal than *via* the Suez route, and about 2,400 miles nearer than by way of the Cape of Good Hope. The distances to Liverpool from the most important groups of South Pacific Islands north of New Zealand will be from 500 to 5,000 miles less *via* the Isthmian Canal than by way of Suez. The entrances and clearances of New Zealand's trade with northwestern Europe, France, and countries farther north amounted to 481,178 tons net register in 1899, and the commerce of that part of Europe with the other islands of the South Pacific east of Australia to 181,743 tons. Of this total traffic of 662,921 tons not less than 500,000 might have advantageously used an Isthmian canal, and this amount should be added to the tonnage of the canal traffic originating or terminating in America. This makes the total obtained by the Commission's investigation of the tonnage that

might have used an Isthmian canal, in 1899, 4,574,852 tons net register.

The above totals for the tonnage that might have used an Isthmian canal in 1899 do not include any of Europe's trade with Australia and Japan, a part of which would have used an Isthmian waterway. The distance from Great Britain to Sydney and Yokohama by the Suez and Isthmian Canal routes is approximately the same, and vessels going by America in either direction *en route* between Europe and Japan or Australia will pass regions from which there is a heavy export tonnage. If it be assumed that only 10 per cent. of the vessel tonnage of the Australian trade with the ports of northwestern Europe and only 5 per cent. of the tonnage of the Japanese commerce with those ports would have taken an American canal route the total for 1899 should be increased 316,223 tons, and be raised from 4,574,852 to 4,891,075 tons.

It was, fortunately, possible to compare the results of the two investigations made for the Canal Commission with the figures for canal traffic that had been determined by the New Panama Canal Company as the result of an elaborate study of vessel movements which that company had carried on continuously from the beginning of 1894. The method employed by the New Panama Canal Company was to make a list of all the vessels of the world, to keep a record of their movements, and at the close of each year to summarize the tonnage of those vessels whose movements had been such that they would have passed through the Panama Canal had there been one in existence. This elaborate and excellent study showed that a total traffic of 5,001,798 tons net register would have passed through the canal during 1899. The figures obtained by the New Panama Canal Company were slightly in excess of those resulting from the investigation made for the Commission by a study of entrances and clearances; but the two totals corresponded as nearly as could have been expected, in view of the differences of the methods employed, and in view of the fact that the two periods covered were not exactly synchronous. In each case the total approximated 5,000,000 tons.

The prospect is that the canal will be completed and ready for traffic by 1914. To what figures will the available tonnage of 1899 have increased during the fifteen years ending in 1914? In order to show more clearly the rate at which the tonnage of available traffic was increasing the New Panama Canal Company in 1898 computed the tonnage of traffic that was available in 1888. A study of their figures for those two years shows that the available

canal traffic had increased 25.1 per cent. during that decade. In order to determine whether that rate of increase might properly be accepted, the writer made a study of the rate of growth of traffic of various sections of the world with the United States and Europe.

It was found that the value of the trade between the Atlantic coast of the United States and Pacific South America increased 26.8 per cent. during the decade 1889–1899. For the commerce between our Atlantic seaboard and Pacific countries other than South America the growth was 49.7 per cent. The trade of the United States with Australasia more than doubled during the decade ending in 1900. The vessel movements between Europe and Chile increased 33.3 per cent. during the ten years ending in 1898. European entrances from the west coast of South America gained 36.5 per cent. While the trade between the Pacific Coast of the United States and trans-Pacific countries will not use the canal, the rate at which that commerce is increasing may well be considered in this connection. The total entrances and clearances of the trade between our Pacific Coast and Hawaii, Siberia, Japan, China, and Hong Kong gained 191 per cent. from 1889 to 1899.

It was evident that a rate of 25.1 per cent. per decade might be taken as a very conservative estimate of the growth in the tonnage of available canal traffic between 1899 and 1914. An increase of 25.1 per cent. per decade would raise the tonnage of 1899 to approximately 7,000,000 tons for 1914; and a traffic of that amount may safely be predicted for the early years of the operation of the canal.

The rate at which the traffic of the canal will increase after the waterway has been put in operation must be a matter of conjecture. But it will be interesting to inquire what the prospects are. One naturally turns to the Suez Canal for the purpose of comparison; but the history of the traffic of that waterway can hardly be repeated in the case of the Panama Canal route. The Suez Canal was opened in 1869, and there was a very moderate growth of traffic for about five years. The total net tonnage for the first five years amounted to only 5,358,237 vessel tons. The slow increase during the first few years was due to the fact that the Suez Canal could be used only by steamers, and in 1870 there was but a small number of steamers available for the commerce of Europe with the East Indies. Steamers had to be constructed and substituted for sailing vessels before the Suez route could be adopted in place of the course around the Cape of Good Hope for any considerable volume of traffic. After the substitution had

been made the rate of increase in tonnage was rapid. During the third five-year period the traffic was 217 per cent. of that of the second five-year period. During the fourth five-year period the traffic was 286 per cent. of that of the second five-year period, and during the sixth quinquennial period—1895–1899—the tonnage was 401 per cent. of the traffic during the years 1875–1879. During the last quinquennial period of the twenty-five years from 1875 to 1899 the traffic of the Suez Canal was four times that of the first five years of that period. During the second decade of the operation of the Suez Canal—that is, from 1880 to 1890—there was an increase of 125 per cent. tonnage over the previous decade.

If it be assumed that the tonnage of the American canal during the first ten years of its operation will increase only one-half as fast as the traffic of the Suez Canal did during the second decade of its existence, the rate of growth predicted for the Panama Canal will be 62½ per cent. An increase of 62½ per cent. in the estimated figures for 1914—approximately, 7,000,000 tons—would give a tonnage of about 11,250,000 for the year 1954. It would be difficult to conceive of a more conservative estimate than this, and yet it shows a relatively large prospective traffic for the American canal at the the close of the first ten years. The figures for the American canal for 1924 are about the same as those for the-present tonnage of the Suez Canal. The traffic of the Suez waterway in 1914 will probably be at least one and one-half times its present amount.

THE EXPLORATIONS OF THE RUSSIAN HYDROGRAPHIC EXPEDITION IN THE ARCTIC OCEAN IN 1902.*

The Russian Hydrographic Commission reports, concerning the fifth season of field work in the Arctic Ocean during the summer of 1902, that important progress was made in the survey of the coast-line and in the sounding and survey of the Kara Sea and of the shoals on the White Sea. Much material was obtained for the correction of the very imperfect existing charts of the region. During the frequent interruptions of survey work, on account of the ice, meteorologic, magnetic, tidal, and current observations were made, and dredging was done for the collection of material

*Condensed from Annalen d. Hydr. u. Marit. Meteorologie, 1903, Heft XI, p. 492.

for the study of the fauna and the flora of the Arctic. The expedition consisted of two Archangel steamers, the *Pachtusoff* and the *Lieutenant Oftsyn*, of which the latter took part only in the work in the northern part of the White Sea. The leader of the expedition, Captain A. Warnek, was upon the *Pachtusoff*. The late spring and the consequent position of the ice did not permit the ships to leave Archangel until 7/20 June.

The first task of the season was the survey of the Orloff shoals—a difficult matter, because they are narrow, and some are only about a mile in length. The dangerous western boundary of the shoals was found to be 2½ nautical miles nearer the coast than was indicated on the charts. The least depth of water on the shoals was determined as 4 feet, instead of 12 feet, as indicated on the charts. Seven fathoms was the least depth noted in the channel between the shoals and the coast, and the whole bottom was found to be incorrectly given on the charts. The average temperature of the air from 8/24 June to 21 June/7 July was +2.1°C, with a minimum of −0.5° C. on 14/27 June, and a maximum of +6.9° C. on 22 June/5 July. Snow fell five times. At the Orloff lighthouse, on the coast, the extremes were somewhat greater. The tide interval, as determined at the Orloff lighthouse, is about 10 hours 21 minutes. Spring tide rises 19 feet 6 inches, neap tide 10 feet 4 inches, but these values are greatly affected by the wind. The strongest current was found on the Gorjainoff Bank, where it amounts to 3½ nautical miles per hour, toward S. W. during flood, and toward N. E. during ebb. The wind had little effect upon either direction or velocity of the currents.

After finishing the work upon the Orloff banks, the ships returned to Archangel for supplies, and on 3/16 July the *Pachtusoff* started alone for the mouth of the Petchora River. The attempt to pass north of Kolgujeff Island was unsuccessful on account of ice, and the ship had to turn back and take the southern route.

A survey of the coast of the Russian Cape (Russky Saworot) peninsula was made. The position of the extremity of the Cape was found to be 68° 58¼′ N., 54° 35′ E., 3½ minutes farther east, and ¾ minute south of the position given on the old charts. Shoals are lacking from the north shore of the peninsula, and the 5-fathom line is about half a mile from the coast. Unusually warm weather prevailed, the average temperature on 8 July being + 16.5° C. in air and + 15° C. in the ocean. Within the Petchora estuary the water was considerably warmer (+19.5° C. near Nikitsa on 20 July/2 August).

The *Pachtusoff* left the Petchora River on 26 July/8 August, and proceeded to the Kara Strait, where a surveying party was left on Waigatch Island. After two unsuccessful attempts to enter the Kara Sea—great quantities of ice still blocking the way—the steamer explored the the northwest side of Waigatch and discovered an anchorage which is protected from all winds and from moving ice. This is the only anchorage in the region, and it is of particular importance to ships making for Nova Zembla. Coal ships could winter here comfortably, there being plenty of fresh water upon Waigatch near at hand, and there being no danger of crushing by the ice. The value of "Pachtusoff Roadstead," as it was christened, is increased by its entrance being from the Arctic Ocean, and not from the Kara Sea. It is easy to find and to enter, and the expedition set beacons along the proper channel.

On 16/29 August the steamer went to the Yugor Strait to begin the survey of the southwest coast of the Kara Sea. Fifty years had elapsed since the last preceding Russian surveys were made along this coast. The *Pachtusoff* was weather-bound for several days in a protected bay, which Captain Warnek discovered in 1900 in the southwest part of Waigatch Island, and the survey work was brought to an end on 25 August/7 September by the closing of the season. Another good anchorage was discovered in the strait between Mjestny Island and the coast. Soundings decrease gradually from 18 to 20 fathoms near Mjestny Island to 7 fathoms near the mouth of the Kara River. From the mouth of the Kara the depth of the water increases regularly to a point 18 nautical miles E. N. E. from Mjestny Island, where 95 fathoms was found. The depth of the Kara Sea has been greatly exaggerated. At the spot where Russian Admiralty chart No. 432 shows the maximum sounding as 406 fathoms the present survey found but 100 fathoms, and the deepest portion measured in 1902 gave but 120 fathoms. The salt content of the water of the southern part of Kara Sea is rather high, and it decreases very little on going toward the Baidaratskaia Bay, from 1.0250 at the Yugor Strait to 1.0185 near the mouth of the Kara. The temperature of the water likewise increased in the same direction.

In Kara Strait the expedition found very uneven bottom, with remarkably rapid changes in the soundings. At one time 9 minutes of slow steaming brought the ship from a sounding of 65 fathoms to one of 5½ fathoms. Both ends of the strait show deep water—80 fathoms at the west end, 60 fathoms at the east end—with much shallower water in the middle. Upon the submerged ridge, which

extends from Waigatch Island toward Nova Zembla, the maximum sounding was determined at 25 fathoms, but nothing of 20 fathoms or less was found.

The following magnetic observations were among those made by the expedition:

Orloff lighthouse, 7.30 P.M., 11/24 June.....Decl., 8° 18.4′ E.
Russian Cape (Russky Saworot) Penin., 8 P.M.,
8/21 July..... " 16° 8.8′ E.
Northwest coast of Waigatch Island, 10 A.M.,
28 July/10 August..... " 18° 47.8′ E.
Near the mouth of the Kara River, 10 A.M.,
25° August/7 September..... " 19° 33.5′ E.

E. O. H.

ALASKAN CABLES AND TELEGRAPHS.

The accompanying map is reduced from the new War Department map showing the completed cable lines in Alaskan waters, those that are proposed and are to be carried out next year, the telegraph lines now in operation in the Territory, and the British Columbia land line from Ashcroft, on the Canadian Pacific R.R., to Dawson and Eagle.

It is expected that the cable from Seattle to Sitka and Juneau will be laid in April next. The cable, 1,300 miles in length, was manufactured near New York City after Congress had authorized the line on March 3, 1903, and was delivered at San Francisco in the fall. The route from Seattle to Sitka was surveyed by Capt. J. F. Pratt, of the Coast and Geodetic Survey.

The cable route passes from Puget Sound out into the Pacific to the west of Vancouver Island and the Queen Charlotte Islands, and then makes straight for the south end of Baranov Island, on which Sitka is situated. At the south end of this island one branch will be laid north to Sitka and the other northeast through the coastal channels to Juneau.

The map shows that two cable lines in Alaskan waters have already been completed. One of them extends from Juneau up Lynn Canal to Skagway; the other connects St. Michael with Nome, the centre of the largest placer gold-mining industry in

C.Romanzof
NUNIVAK ID.
KUSKOKWIM RIVER
YUKON
SITKA DIST.
Stikkine R.
Tonsina
Teikhell
Valdez
Shina
Fort Liscum
PRINCE WILLIAM SD.
Orca
Natchek
Kayak
Keystone
Lowe River
Mt.St.Elias 18,010 ft.
Copper Center
Christochina
Selwyn
Fort Selkirk
Five Fingers
Tantalus
Big Salmon
Hootalinkwa
Lower Leberge
Upper Leberge
White Horse
Miles Canyon
Tagish
Caribou Crossing
Bennett
Skagway
Haines Mission
Yukatat
Lake Clark
Iyoonok
Cook Inlet
Iliamna Lake
Homer
Seldovia
C.Newenham
BERING SEA
GULF OF ALASKA
Katmai
KODIAK ISLAND
Karluk
Kodiak
ALASKA PENINSULA
Unga
Dundas Bay
Juneau
Skagway
Telegraph Creek
Iskoot
Echo
Killisnoo
Sitka
Petersburg
Fort Creek
Ft. Wrangel
C.Ommaney
Petersburg
Fort Simpson
Nahlin
Makina
Atlin
Pike
BRITISH COLUMBIA
Teslin R.
Yukon R.
White R.
Stikine R.
Taku Inlet
Lynn Canal
Chilkoot Inlet
Portland Canal
Prince of Wales I.
Revillagigedo I.
LEGEND
TELEGRAPH LINES AND STATIONS
U. S. MILITARY CABLES
" " " PROPOSED
166
162
158
154
150
146
142
138
134
130
60
56

SIGNAL CORPS TELEGRAPH SYSTEM
IN
ALASKA
AND
CANADIAN LINE
Connecting with the United States
Prepared under the Direction of Brigadier General
A. W. Greely, Chief Signal Officer, U. S. Army
SCALE OF MILES
0 40 80 120
CONTINUATION OF
CANADIAN LINE
SCALE OF MILES
0 50 100 150
174 170 166 162 158 154 150 146 142 138
122 126 130
64 60 68 52
BERING STRAIT
East Cape
C. Prince of Wales
C. York
Pt. Spencer
KOTZEBUE SOUND
Noatak R.
Kobuk R.
Nome
Ft. Davis
Safety Harbor
Golovin
C. Nome
NORTON SOUND
St. Michael
Unalaklik
Golsova
Koyukuk
Nulato
Kaltag
Old Woman
Koyukuk R.
Grim
Nop
Louden
Tehoclatliny
Tetlot
Kokrines
Birches
Fort Gibbon
Rapids
Hampart
Cosna
Baker
Chena
Fairbanks
Tolavana
Nenana
Salcha
Circle City
Fort Yukon
Porcupine River
YUKON DISTRICT
YUKON RIVER
TANANA RIVER
Mt. McKinley
20,450 ft.
C. Romanzof
Innoko R.
Tananna Crossing
Mentasta Pass
Christochina
Copper Center
Tonsina
Valdez
Eagle
Fort Egbert
North Fork
Summit
Boundary Post
Fort Cudahy
Dawson
Central
Ketchumstock
Goodpaster
Ogilvie
Stewart River
Pelly R.
Fort Selkirk
Selwyn
Five Fingers
Tantalus
Big Salmon
Hootalinkwa
Lower Leberge
Upper Leberge
Little Salmon
Nisutlin R.
White R.
Copper R.
Skolai Creek
NUNIVAK ID.
KUSKOKWIM RIVER
No. 5 Sta.
No. 4 Sta.
No. 3 Sta.
No. 2 Kaido
No. 1 Klaproxe
Hazelton
No. 6 Sta.
No. 7 Sta.
No. 8 Sta.
Alexander
Ft. Fraser
Station
Kitsalas
Telegraph Point
Chincat
Bobtail
Blackwater
Quesnelle
Port Simpson
BRITISH COLUMBIA
PREVOST I.
Ashcroft
Lytton
Yale
Vancouver
VANCOUVER ISLAND
Victoria
Seattle

Alaska. Unfortunately, the cable between St. Michael and Nome has been broken by ice in the shallow waters of Norton Sound, and the break is not yet repaired. Thus Nome, a town of 25,000 inhabitants, is now isolated, and will be till navigation opens about June 1 next.

The Signal Corps has built 1,740 miles of land lines, and we are already in electric communication with various districts of the Territory. Despatches, for example, may be sent from Juneau by the Lynn Canal cable to Skagway, and thence by the land line toward the Yukon River, to be transferred to the British Columbia telegraph and the United States; or they may be sent from Valdes, on Prince William Sound, the port for the Copper River mines, by the line we have completed to Eagle, on the Yukon, and thence up the Yukon to Dawson, British Columbia, and the United States; or they may be sent from St. Michael up the Yukon and Tanana Rivers to Eagle and there forwarded by the Canadian lines. The numerous telegraph stations scattered along these lines are indicated on the map.

Most of our mining centres in Alaska are now provided with telegraph facilities. The chief exceptions are the great placer-mining region of the Seward Peninsula, of which Nome is the main point; and the mining camps of Cook Inlet and of the interior region around Circle City and the northern bend of the Yukon.

These land lines have been constructed under great difficulties, and the Signal Corps is entitled to unstinted praise for its arduous and successful labours. The winter months were found to be the best working season, though the mean temperature is below zero and the snow is deep. Practically no wagon roads exist in the country traversed, and the material had to be sledded into the interior in midwinter or carried by pack animals over the roughest imaginable trails. Many hardships might have been escaped if it had not been found that the cold and snow of winter are less unfavourable for building telegraph lines than are the morasses and fires of summer. The importance of the telegraph system will rapidly increase as the increasing number of miners enlarges business interests.

REPORT OF R. E. PEARY, C.E., U.S.N., ON WORK DONE IN THE ARCTIC IN 1898–1902.*

Mr. President, and
Members of the Peary Arctic Club :

In January, 1897, I promulgated before the American Geographical Society, of New York City, my plan for an extended scheme of Arctic exploration, having for its main purpose the attainment of the North Pole. During the spring of 1897, your President, Morris K. Jesup, became interested in the matter, and suggested the idea of the present Club. His example was followed by other prominent men, and late in May, through the persistent personal efforts of Chas. A. Moore, backed by letters from these and other influential men, five years leave of absence was granted me by the Navy Department, to enable me to carry out my plans.

It being too late that season to get the main expedition under way, the summer of 1897 was devoted to a preliminary trip to the Whale Sound region, to acquaint the Eskimos with my plan for the coming year, and set them to work laying in a stock of skins and meat. These objects were successfully accomplished, and in addition the great "Ahnighito" meteorite of Melville Bay, the largest known meteorite in the world, was brought home.

In December, 1897, while I was in London, the steam yacht *Windward*, which had been used in his Franz Josef Land expedition, was tendered to me by Alfred Harmsworth, who offered to have her re-engined and delivered to me in New York. This generous offer I accepted.

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*THE PEARY ARCTIC CLUB OF NEW YORK CITY,
NEW YORK, Oct. 15, 1903.

SIR :

We enclose herewith, for such consideration and action as your Society may deem advisable, copy of the report, with accompanying maps and photographs of Commander Peary, U.S.N., on the work which has been done under the auspices of this Club during the years 1898–1902.

We have the honor to be,
Yours very respectfully,
MORRIS K. JESUP,
President.
H. L. BRIDGMAN,
Secretary.

THE SECRETARY
American Geographical Society,
New York.

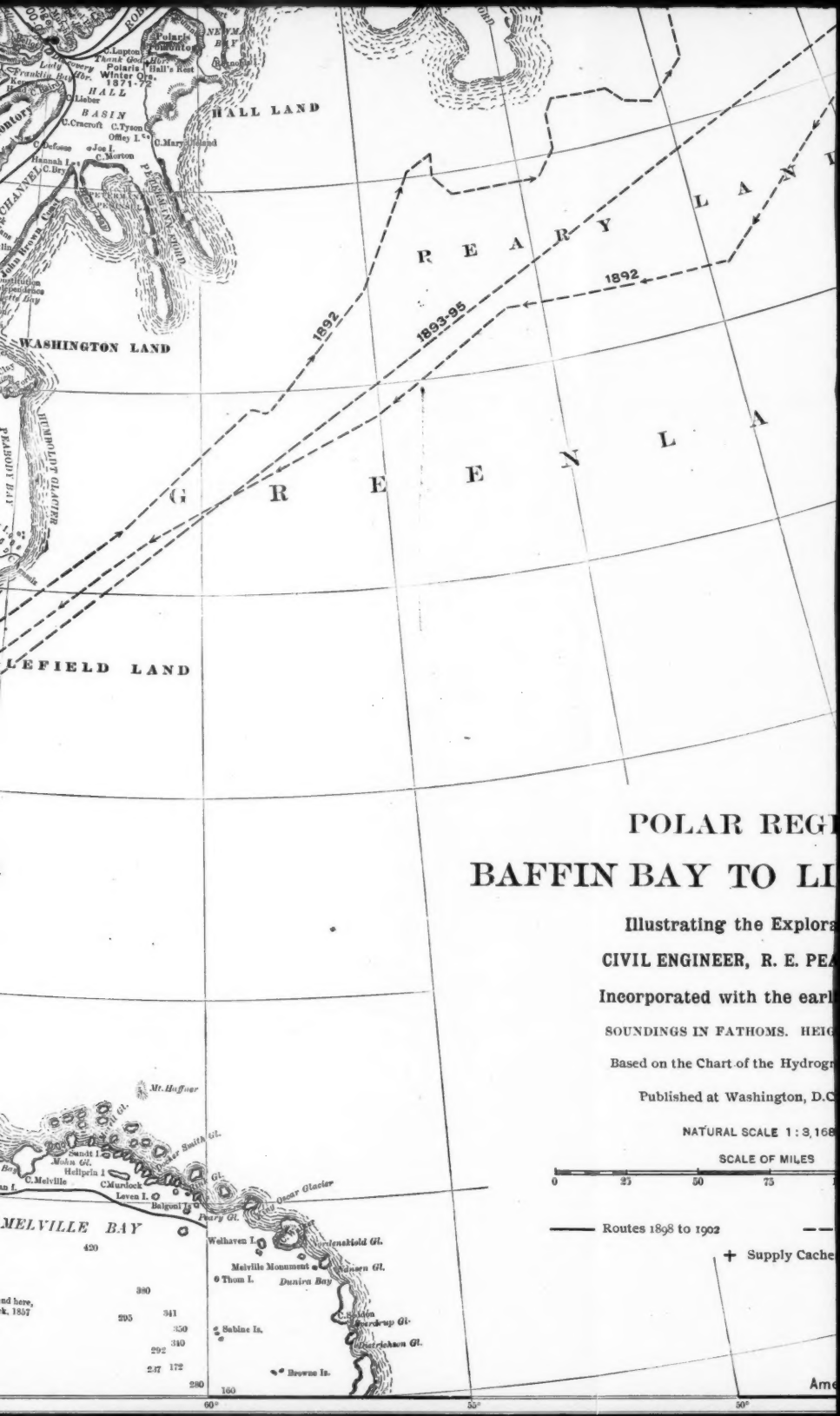
105°
100°
95°
90°
85°
80°
75°
83
82
81
80
79
GRANT LAND
GARFIELD COAST
JESUP LAND
ARTHUR LAND
GREELY FIORD
GRINNELL LAND
MER DE GLACE AGASSIZ
VICTORIA AND ALBERT MOUNTAINS
RANGE
UNITED STATES
LAKE HAZEN
Aldrich, May 18, 1876
C. Alfred Ernest
Challenger Mountains
Fletcher L.
Mt. Arthur
Musk Ox Valley
Mt. Beaumont
Mt. Moore
Mt. Bridgman
C. Lockwood
C. Bridgman
Cleaver Bay
Antinoutte Bay
Judge Daly Promontory
KENNEDY
DARLING PENINSULA
C. Du Chaillu
C. Napoleon
Irving L.
Lockwood
Discovery Bay
Albert Edward
Columbia
Markham Bay
Parr Bay
Cooper Key
Mt. Hornby
2,000
Mt. Rawlinson
Twin Mts.
Mt. Whistler
Connell Mt.
Birderbick Mt.
Garfield
Mt. Nansen
Mt. Beaumont
Lawrence
Wilkes
Morris Bay
Calhoun
Wright Bay
Case Bay
Boston Bay
Mt. Dorward
Mt. Stevenson
Mt. Smith
Mt. Peary
Mt. Parker
Mt. Baker
Mt. Sumner
Mt. Hunter
Mt. Wilson
Mt. Lincoln
Mt. Garfield
Mt. Hubbard
Mt. Hall
Mt. Greely
Mt. Nansen
Mt. Beaumont
Mt. Dorward
Mt. Stevenson
Mt. Smith
Mt. Peary
Mt. Parker
Mt. Baker
Mt. Sumner
Mt. Hunter
Mt. Wilson
Mt. Lincoln
Mt. Garfield
Mt. Hubbard
Mt. Hall
Mt. Greely

Peary's Farthest North
84°17' April 21, 1902.
1902
LINCOLN SEA
1900
KELTIE GULF
NARES LAND
ROBESON CHANNEL
HALL LAND
HALL BASIN
Polaris Promontory
Polaris Winter Qrs. 1871-72
Fort Conger
1900 Camp
Cape Hecla
Cape Joseph Henry
Cape Beaufort
Cape Britannia
Cape Baird
Cape Union
Cape Sheridan
Cape Rawson
Cape Lupton
Cape Defosse
Cape Tyson
Cape Morton
Cape Collinson
Cape Jefferson
Cape Hamilton
Cape Webster
Cape Crozier
Cape Constitution
Cape Independence
Cape Washington
Cape Morris Jesup
Cape Thomas Hubbard
Cape Columbia
Cape Aldrich
Cape Gladstone
Cape Baird
Cape Richardson
Cape Brinknap
Cape Crosswell
Cape Colan
Cape Rawlinson
Cape Beaufort
Cape Britannia
Cape Baird
Cape Union
Cape Sheridan
Cape Rawson
Cape Lupton
Cape Defosse
Cape Tyson
Cape Morton
Cape Collinson
Cape Jefferson
Cape Hamilton
Cape Webster
Cape Crozier
Cape Constitution
Cape Independence
Cape Washington
Cape Morris Jesup
Cape Thomas Hubbard
Cape Columbia
Cape Aldrich
Cape Gladstone
Cape Baird
Cape Richardson
Cape Brinknap
Cape Crosswell
Cape Colan
Cape Rawlinson
Mt. Parry
Mt. Gilbert
Mt. Daniel Pasha
Mt. Beaufort
Mt. Britannia
Mt. Albert Beaumont
Mt. Frederick
Mt. Hooker
Mt. Coppinger
Mt. Farragut
Mt. Gardiner
Mt. Gladstone
Mt. Diamond
Mt. Foster
Mt. Beverly
Mt. Clay
Mt. Grinnell
Mt. Stanley
Mt. Hall
Mt. Pierce
Mt. Gray
Mt. Buttress
Mt. Mary Leland
Mt. Gardiner
Mt. Hooker
Mt. Coppinger
Mt. Farragut
Mt. Parry
Mt. Gilbert
Mt. Daniel Pasha
Mt. Beaufort
Mt. Britannia
Mt. Albert Beaumont
Mt. Frederick
Mt. Diamond
Mt. Foster
Mt. Beverly
Mt. Clay
Mt. Grinnell
Mt. Stanley
Mt. Hall
Mt. Pierce
Mt. Gray
Mt. Buttress
Mt. Mary Leland
Degree Hill
Observation Hill
Black Cape
Middle Pt.
Cape Berard
Cape Joseph Henry
Cape Hecla
Cape Beaufort
Cape Britannia
Cape Baird
Cape Union
Cape Sheridan
Cape Rawson
Cape Lupton
Cape Defosse
Cape Tyson
Cape Morton
Cape Collinson
Cape Jefferson
Cape Hamilton
Cape Webster
Cape Crozier
Cape Constitution
Cape Independence
Cape Washington
Cape Morris Jesup
Cape Thomas Hubbard
Cape Columbia
Cape Aldrich
Cape Gladstone
Cape Baird
Cape Richardson
Cape Brinknap
Cape Crosswell
Cape Colan
Cape Rawlinson
Lockwood & Brainard May, 1882.
Lockwood I.
Hannah I.
Mary Murray I.
Hall Fiord
Lockwood Inlet
Beaumont Inlet
Hannah Inlet
Mary Murray Inlet
Hall Inlet
Victoria Inlet
Northern Gate Inlet
Distant Cape Inlet
Cape Bayer Inlet
Cape Henry Inlet
Cape Markham Inlet
Cape Frederick Inlet
Cape Albert Inlet
Cape Beaumont Inlet
Cape Britannia Inlet
Cape Baird Inlet
Cape Union Inlet
Cape Sheridan Inlet
Cape Rawson Inlet
Cape Lupton Inlet
Cape Defosse Inlet
Cape Tyson Inlet
Cape Morton Inlet
Cape Collinson Inlet
Cape Jefferson Inlet
Cape Hamilton Inlet
Cape Webster Inlet
Cape Crozier Inlet
Cape Constitution Inlet
Cape Independence Inlet
Cape Washington Inlet
Cape Morris Jesup Inlet
Cape Thomas Hubbard Inlet
Cape Columbia Inlet
Cape Aldrich Inlet
Cape Gladstone Inlet
Cape Baird Inlet
Cape Richardson Inlet
Cape Brinknap Inlet
Cape Crosswell Inlet
Cape Colan Inlet
Cape Rawlinson Inlet
Markham I.
Victoria Inlet
Northern Gate Inlet
Stephenson Inlet
Reef I.
Middle I.
Black Cape

Peary's Farthest North
84°17' April 21, 1902.
1902
LINCOLN SEA
1900
KELTIE GULP
NARES LAND
ROBESON CHANNEL
HALL LAND
PEARY
1892
1893-96
WASHINGTON LAND
KENNEDY CHANNEL
Judge Daly Promontory
HALL BASIN
Polaris Winter Qrs. 1871-72
Fort Conger 1900
Lockwood & Brainard May, 1882.
Cape Hecla
Cape Joseph Henry
Cape Bryan
Cape Britannia
Mt. Albert
Mt. Parrayant
Mt. Copping
Mt. Hooker
Mt. Gardiner
Mt. Gladstone
Mt. Columbia
Mt. Aldrich
Mt. Horatio
Mt. Diamond
Mt. Beaumont
Mt. Rawlinson
Mt. Grant
Mt. Parry
Mt. Wrangel
Mt. Chamberlain
Mt. Daniel
Mt. Hall
Mt. Farquhar
Mt. Lieber
Mt. Morton
Mt. Mary Island
Mt. Defosse
Mt. Franklin
Mt. Jefferson
Mt. Hamilton
Mt. Madison
Mt. Calhoun
Mt. Webster
Mt. Clay
Mt. Constitution
Mt. Independence
Mt. Liberty
Mt. Lawrence
Mt. Morris
Mt. Good
Mt. Wright
Mt. Beecroft
Mt. Foster
Mt. Clements Markham
Mt. Hilgard
Mt. Pullen
Mt. Sheridan
Mt. Rawson
Mt. Union
Mt. Lincoln
Mt. Tyson
Mt. Crocroft

35°
30°
25°
20°
15°
MC KINLEY SEA
Peary, May 16, 1900.
Lat. 83° 50'; Var. 61¼ W.
Cape Bridgman
Daly Mts.
Bliss Bay
C. Morris Jesup
Peary, May 22, 1900.
Cape John Fiske
C. Richard Schley
Frederick E. Hyde Fiord
D. Clarence Wyckoff
C. Henry Parish
Alfred Harmsworth Glacier
RANGE
ROOSEVELT
HAZEN LAND
MELVILLE LAND
EAST GREENLAND SEA
HEILPRIN LAND
INDEPENDENCE BAY
PEARY CHANNEL
C. Glacier
ACADEMY LAND
1892
83°
82°
81°
80°
79°

JESUP LAND
GREELY FIORD
GRINNELL LAND
ARTHUR LAND
ELLESMERE LAND
KANE BASIN
BAFFIN BAY
INGLEFIELD
PRUDHOE LAND
CARY ISLANDS
GLACIER STRAIT
LADY ANN STRAIT
SMITH SOUND
KENNEDY CHANNEL
HUMBOLDT GLACIER
VICTORIA AND ALBERT MOUNTAINS
DARLING PENINSULA
Winter Qrs. 1898-99
Winter Qrs. 1899-1900
Anniversary Lodge
Head Qrs. 1895-95
Redcliffe Head
Winter Qrs. 1891-92
Bergs ground here, McClintock, 1857
Connell Mts.
Biederbick Mts.
Fletcher L.
Mt. Arthur
Musk Ox Valley
Mt. Nelson
Mt. Beaumont
Judge Daly Promontory
Mt. Bedford
Mt. Smith
Mt. Stevens
Mt. Dromedary
Mt. Moore
Mt. Bridgman
C. Lockwood
C. Bruland
Antoinette Bay
Adolf Bay
Common Bay
Sun Hollow Gl.
Hunter Bay
Flagler Bay
Kaldwell Bay
Hill Bay
Sands Gl.
Buchanan Bay
Alfred Leffert Gl.
Wyville Thomson Gl.
Stanley Gl.
Colgate Inlet
Gale Pt.
C. Isabella
Littleton I.
Cairn Pt.
Hatherton Bluff
Radcliffe Pt.
Dunsterville Head
Prince Bluff
C. Faraday
Talbot Inlet
Bonne Pt.
Boger Pt.
Smith Bay
Rice Glacier
Mittie I.
Sanders I.
C. Cumberland
Hayter Hd.
Mt. Glennsorth
Clarence Head
C. Norton Shaw
C. Tennyson
Phillips Pt.
C. Washington
COBOURG I
C. Leopold
Kent I.
Princess Charlotte Monument
Hakluyt I.
Northumberland I.
Josephine Peary Gl.
Bastion Pt.
Whale Sound
Hope Pt.
Booth Gl.
Blackwood Gl.
Three Sister Pt.
Saunders I.
Dalrymple Rk.
Wolstenholm I.
Wolstenholm Sound
North Star Bay
C. Atholl
Petowik Gl.
C. Dudley Digges
Parker Snow Pt.
Conbeal Pt.
Parker Snow Bay
C. York
Bushnan I.
Regent Bay
Victoria I.
Irontown
Sanderson Mts.
Lincoln Sea
Cape Jefferson
Cape Hamilton
Cape Madison
Cape Weiss
Cape Clay
Wright Bay
Case Bay
Boston Bay
Morris Bay
Lawrence
Fredk. Jackson Promontory
Richardson Bay
Wilkes
Smith Sound
Kane Basin
Brooks I.
Advance Bay
Dallas Bay
Marshall Bay
Tancy Bay
Francis
Rensselaer Bay
Markham Gl.
Parry Gl.
Aldrich Gl.
Morris K. Jesup Gl.
Clements Markham Gl.
Victoria Head
Albert
Camperdown
Rutherford
Sabine
Ingersoll
Ladyer
Foster Bay
Lincoln Bay
Marshall
Russell
Kent
Wood
Scott
Lee
Greely Gl.
Sherard Osborn Fd.
Lockwood Gl.
Nares Gl.
Markham Gl.
Aldrich Gl.
Jesup Gl.
Hall Dome
Cape Alexander
Cape Sabine
Cape Isabella
Cape Bryant
Cape Parry
Cape Crozier
Cape Constitution
Cape Independence



POLAR REGI

BAFFIN BAY TO LI

Illustrating the Explora

CIVIL ENGINEER, R. E. PEA

Incorporated with the earl

SOUNDINGS IN FATHOMS. HEIG

Based on the Chart of the Hydrogr

Published at Washington, D.C

NATURAL SCALE 1 : 3,168

SCALE OF MILES

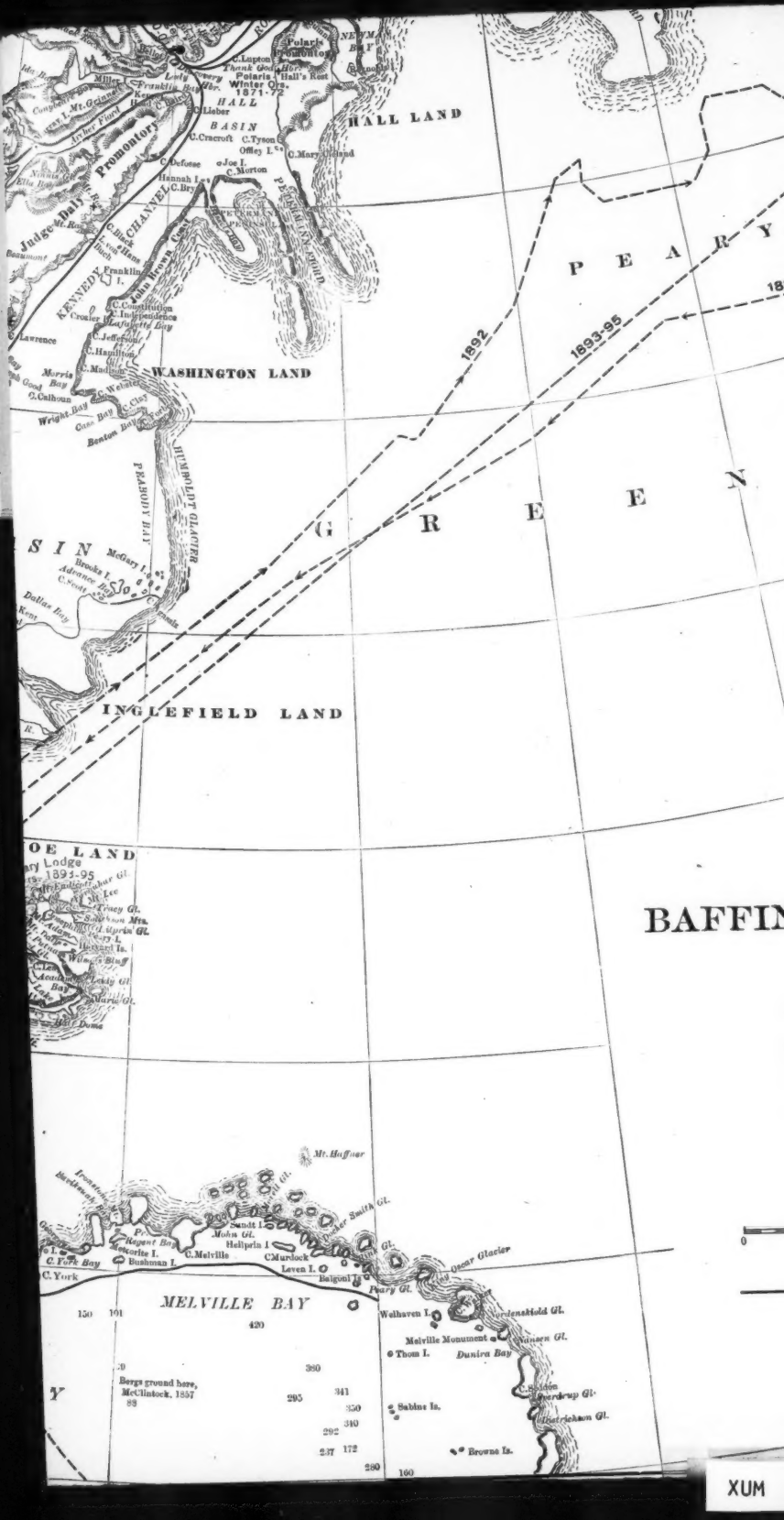
0 25 50 75

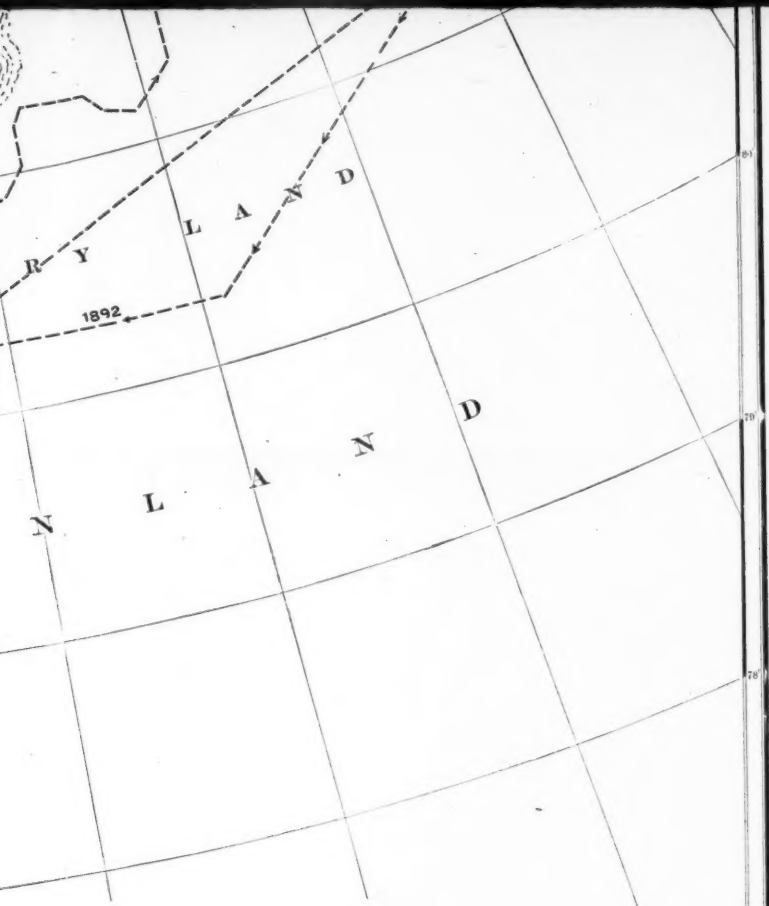
Routes 1898 to 1902

+ Supply Cache

Ame

XUM


HALL LAND
HALL BASIN
Polaris Promontory
Hall's Rest
Winter Qrs. 1871-72
C. Lieber
C. Tyson
C. Morton
C. Defosse
Joe I.
Hannah I.
C. Brevoort
Judge Daly Pr.
Promontory
Archer Fiord
Franklin Bay
Miller
Lady Franklin Bay
Beaumont
KENNEDY CHANNEL
Frankfort Bay
C. Constitution
C. Independence
C. Lawrence
C. Jefferson
C. Hamilton
C. Madison
C. Webster
C. Clay
C. Calhoun
Morris Bay
Good Bay
Wright Bay
Case Bay
Benton Bay
WASHINGTON LAND
PEARY
1892
1893-95
GREEN
HUMBOLDT GLACIER
PEABODY BAY
McGary I.
Brooks I.
Dallas
Dollar Bay
Kent
INGLEFIELD LAND
Lodge
1893-95
Tracy Gl.
Wilmot Bluff
Acadia Bay
Marie Gl.
Mt. Dome
BAFFIN
Mt. Haffner
Sandt I.
Hellprin I.
C. Melville
C. Murdock
Leven I.
Bushman I.
C. York
MELVILLE BAY
Oscar Glacier
Pleary Gl.
Welhaven I.
Melville Monument
Thom I.
Dunira Bay
Sabine Is.
Browne Is.
Bergs ground here, McClintock, 1857
150
101
420
380
295
341
350
340
292
237
172
280
160



POLAR REGIONS

FFIN BAY TO LINCOLN SEA

Illustrating the Explorations of

CIVIL ENGINEER, R. E. PEARY, U.S.N.

Incorporated with the earlier surveys.

SOUNDINGS IN FATHOMS. HEIGHTS IN FEET.

Based on the Chart of the Hydrographic Office,

Published at Washington, D.C., Oct. 1903.

NATURAL SCALE 1 : 3,168,000

SCALE OF MILES

0 25 50 75 100 125 150

—— Routes 1898 to 1902 ——— Routes on Inland Ice

\+ Supply Caches

Bulletin of the
American Geographical Society, December, 1903.

XUM

In the spring of 1898 the Peary Arctic Club was organized, Morris K. Jesup, Henry W. Cannon, H. L. Bridgman, all personal friends of mine, forming the nucleus about which the rest of you assembled, and in May the *Windward* arrived; but, to my regret and disappointment, the machinists' strike in England having prevented the installation of new engines, she was practically nothing but a sailing craft.

The lateness of the season was such that I had to make the most of the *Windward* as she was. But her extreme slowness (3½ knots under favorable circumstances), and the introduction of a disturbing factor in the appropriation by another of my plan and field of work, necessitated the charter of an auxiliary ship if I did not wish to be distanced. The *Windward* sailed from New York on the 4th of July, 1898, and on the 7th I went on board the *Hope* at Sydney, C. B.

1898–1899.

Pushing rapidly northward, and omitting the usual calls at the Danish Greenland ports, Cape York was reached after a voyage, uneventful except for a nip in the ice of Melville Bay, which lifted the *Hope* bodily, and for a few hours seemed to contain possibilities of trouble.

The work of hunting walrus and assembling my party of natives was commenced at once, the *Windward* soon joined us, after which the hunting was prosecuted by both ships until the final rendezvous at Etah, whence both ships steamed out on Saturday, August 13th, the *Windward* to continue northward, the *Hope* bound for home. The *Windward* was four hours forcing her way through a narrow barrier of heavy ice across the mouth of Foulke Fjord. Here the *Hope* left us, straightening away southward toward Cape Alexander, and the *Windward* headed for Cape Hawkes, showing distinctly beyond Cape Sabine.

At four A. M. Sunday we encountered scattered ice off Cape Albert. About noon we were caught in the ice near Victoria Head, and drifted back several miles. Finally we got round Victoria Head into Princess Marie Bay at six P. M. The bay was filled with the season's ice, not yet broken out, while Kane Basin was crowded with the heavy, moving polar pack. Between the two, extending northward across the mouth of the bay, was a series of small pools and threads of water, opening and closing with the movements of the tide. At 11.30 P. M. of the 18th the *Windward* had worried her way across the bay to a little patch of open water close under

Cape D'Urville. Here further progress was stopped by a large floe, several miles across, one end resting against the shore, the other extending into the heavy ice. While crossing the bay the more important stores had been stowed on the deck in readiness to be thrown out upon the ice in the event of a nip. Pending the turning of the tide, when I hoped the big floe would move and let us proceed, I landed at Cape D'Urville, deposited a small cache of supplies and climbed the bluffs to look at the conditions northward.

August 21, I went on a reconnoissance along the ice-foot to the

CAPE ALBERT.

head of Allman Bay and into the valley beyond. The night of the 21st young ice formed, which did not melt again. On the 28th I attempted to sledge over the sea-ice to Norman Lockyer Island, but found too many weak places, and fell back on the ice-foot. The night of the 29th the temperature fell to 13° F., and on the 31st the new ice was four and a quarter inches thick. On this day I went to Cape Hawkes and climbed to its summit, whence I could see lakes out in Kane Basin, but between them and the *Windward* the ice was closely packed—a discouraging outlook. Only a strong and continued westerly wind would give me any chance. I could

not leave the ship for fear an opportunity to advance would occur in my absence.

September 2nd, I started on a sledge trip up Princess Marie Bay. At Cape Harrison the strong tidal current kept the ice broken, so that I could not round it, and the ice-foot was impracticable for sledges. I went on foot to the entrance of Cope's Bay, surveying the shore to that point, and returned to the ship after four days. During this trip I obtained the English record from the cairn on the summit of Norman Lockyer Island, deposited there twenty-two years ago. This record was as fresh as when left.

September 6th, I left the ship to reconnoitre Dobbin Bay, the head of which is uncharted, returning three days later. During this trip the first real snowstorm of the season occurred, five and a half inches falling.

September 12th, one-third of my provisions, an ample year's supply for the entire party, was landed at Cape D'Urville, my Eskimos sledging loads of 700 to 1,000 pounds over the young ice. The night of the 13th the temperature dropped to $-10°$ F., and all hope of further advance was at an end. September 15th the boiler was blown off and preparations for winter commenced.

On the 17th I broached my plans for the winter campaign, as follows:

The autumn work was simple enough and outlined itself. It comprised two items: the securing of a winter's supply of fresh meat and the survey of the Buchanan Strait–Hayes Sound–Princess Marie Bay region. In spite of the peculiarly desolate character of that part of the Grinnell Land coast immediately about the *Windward*, and the apparent utter absence of animal life, I felt confident of accomplishing the former. Various reconnoissances thus far, on the north shore of Princess Marie Bay, had given me little encouragement, but I knew that the Eskimos had killed one or two musk oxen, in years past, on Bache Island, and that region looked favorable for them. As regarded the survey, a presentiment that I must begin it at the earliest moment had led me to make attempts to reach the head of Princess Marie Bay.

As to the spring campaign, I proposed to utilize the winter moons in pushing supplies to Fort Conger, to move my party to that station early in February, and on the return of the sun start from there as a base and make my attempt on the Pole *via* Cape Hecla. I *might* succeed in spite of the low latitude of my starting-point, and, in any event, could reach the ship again before the ice broke

up, with thorough knowledge of the coast and conditions to the north.

September 18th, I left the ship with two sledges and my two best Eskimos, with provisions for twelve days, for a reconnoissance of Princess Marie Bay. September 20th I reached the head of a small fjord running southwest from near the head of Princess Marie Bay, and found a narrow neck of land, about three miles wide, separating it from a branch of Buchanan "Strait." Bache "Island" of the chart is, therefore, a peninsula and not an island. From a commanding peak in the neighbourhood I could see that both arms of Buchanan "Strait" ended about south of my position; that the "Strait" is in reality a bay, and that Hayes Sound does not exist. On the 21st and 22nd I penetrated the arms of Princess Marie Bay, designated as Sawyer and Woodward Bays on the charts, and demonstrated them to be entirely closed.

September 23rd, while entering a little bight about midway of the north shore of Bache Peninsula, I came upon two bears. These my dogs chased ashore and held at bay until I could come up and kill them.

September 25th, I crossed Bache Peninsula on foot with my two men, from Bear Camp to the intersection of the northern and southern arms of Buchanan Bay. Here we found numerous walrus, and could command the southern arm to the large glacier at its head. Comparatively recent musk-ox tracks convinced me of the presence of musk-oxen on the peninsula. The next day I returned to the *Windward* to refit and start for Buchanan Bay *via* Victoria Head and Cape Albert in the quest of walrus and musk-oxen. Henson, in a reconnoissance northward during my absence, had been unable to get more than a few miles beyond Cape Louis Napoleon, the sea ice and the ice-foot being alike impracticable. A day or two after my return I started him off again to try it.

September 30th, I started for Buchanan Bay. Between Victoria Head and Cape Albert I found fresh tracks of a herd of musk-oxen, and followed them until obliterated by the wind. The walrus grounds in Buchanan Bay were reached late on October 4th, and the next day I secured a walrus and the remainder of my party arrived. The following day every one was out after musk-oxen; but, finding it very foggy on the uplands of the peninsula, I returned to camp and went up to Buchanan Bay in search of bears. While I was away one of my hunters killed a bull musk-ox.

On the 7th I sent two men to bring the meat and skin, while I went up Buchanan Bay again. Returning to camp, I found it

deserted. A little later some of the party returned, reporting a herd of fifteen musk-oxen killed. The next two days were consumed in cutting up the animals, stacking the meat and getting the skins and some of the meat out to camp.

October 10th, we started for the ship, which was reached late on the 12th. The ice in Buchanan Bay was very rough, and a snow-storm on the 11th made going very heavy. Five days later, October 17th, I went with two men to locate a direct trail for getting the meat out to the north side of the peninsula, but found the country impracticable, and returned to the ship on the 21st. The sun left us on the 20th.

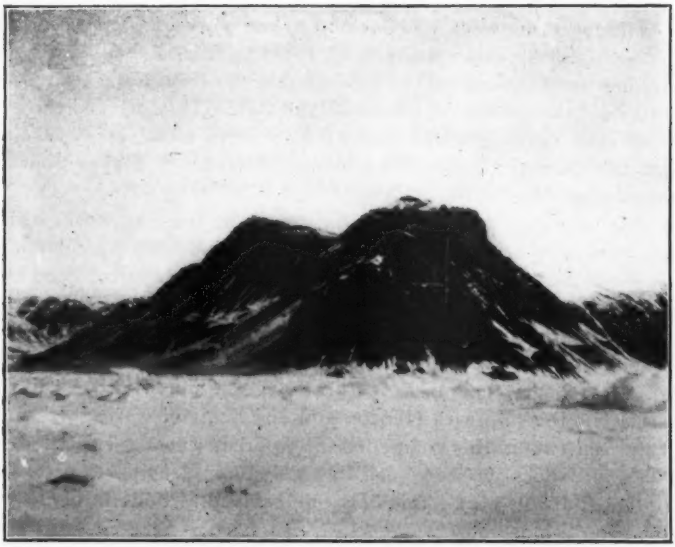
The following week was devoted to the work of preparation for the winter. A reconnoissance of Franklin Pierce Bay developed nothing but hare tracks, but Henson came in from Cope's Bay with a big bear, killed near the head of the Bay. This marked the end of the fall campaign, with our winter's fresh meat supply assured and the Bache "Island"–Buchanan "Strait"–"Hayes Sound" question settled.

The next step was the inauguration of the teaming work, which was to occupy us through the winter. I already had my pemmican and some miscellaneous supplies at Cape Louis Napoleon, and two sledge loads of provisions at Cape Fraser. The rapidly-disappearing daylight being now too limited for effective travelling, I was obliged to await the appearance of the next moon before starting for a personal reconnoissance of the coast northward. On the 29th I left the ship with Henson and one Eskimo. The soft snow of the last two storms compelled me to break a road for the sledges with snow-shoes across Allman Bay and along many portions of the ice-foot, but in spite of this delay we camped at Cape Louis Napoleon after a long march.

The next day we reached Cape Fraser, having been impeded by the tide rising over the foot ice, and camped at Henson's farthest, at the beginning of what seemed an impracticable ice-foot. It was the only possible way of advance, however, as the still-moving pack in the channel was entirely impassable. The following day I made a reconnoissance on foot as far as Scoresby Bay, and though the ice-foot was then impracticable for sledges, I was convinced that a good deal of earnest work with picks and shovels, assisted by the levelling effects of the next spring tides, would enable me to get loaded sledges over it during the next moon. From Cape Norton Shaw I could see that by making a detour into Scoresby Bay the heavy pack could be avoided in crossing.

This stretch of ice-foot from Cape Fraser to Cape Norton Shaw is extremely Alpine in character, being an almost continuous succession of huge blocks and masses of bergs and old floes, forced bodily out of the water and up on to the rocks. At Cape John Barrow a large berg had been forced up on the solid rock of the cape, until one huge fragment lay fully one hundred feet above the high-tide level.

Returning from my reconnoissance, I camped again at Cape Fraser, building the first of the snow igloos, which I intended should be constructed at convenient intervals the entire distance



CAPE LOUIS NAPOLEON.

to Fort Conger. The next three days were occupied in bringing the supplies at Cape Louis Napoleon up to Cape Fraser, and on the 4th of November I returned to the ship.

The time until the return of the next moon was fully occupied in making and repairing sledges, bringing in beef from the cache on Bache Peninsula, and transporting supplies and dog-food to Cape Hawkes, beyond the heavy going of Allman Bay. During much of this time the temperature was in the 40°s Fahr.

November 21, Henson and three Eskimos left with loads, and on the 22nd I followed with a party of three to begin the work of the

November moon. This work ended just after midnight of December 4, when the last sledges came in. It left 3,300 pounds of supplies and a quantity of dog-food at Cape Wilkes, on the north side of Richardson Bay. These supplies would have been left at Cape Lawrence had it not been for the desertion and turning back of one of my men, discouraged with the hard work, while crossing Richardson Bay. Knowing it to be essential to prevent any recurrence of the kind, I pushed on to Cape Wilkes, camped and turned in after a twenty-five-hour day, slept three hours, then started with empty sledge, eight picked dogs and an Eskimo driver, to overtake my man. He was found at Cape Louis Napoleon, and, after receiving a lesson, was taken along with me to the ship.

My party was left with instructions to bring up supplies which the wrecking of sledges had obliged me to cache at various places, assemble all at Cape Wilkes, and then, if I did not return, reconnoitre the ice-foot to Rawlings Bay, and return to the ship.

The distance from Cape Wilkes to the *Windward* was sixty nautical miles in a straight line (as travelled by me along the ice-foot and across the bays, not less than ninety statute miles); and was covered in 23 hours and 20 minutes, or 21 hours 30 minutes actual travelling time. Temperature during the run, −50° F.

Every sledge was more or less smashed in this two weeks' campaign, and at Cape John Barrow sledges and loads had to be carried on our backs over the ice jams. The mean daily minimum temperature for the thirteen days was −41.2° F., the lowest −50° F., which occurred on four successive days.

The experience gained on this trip led me to believe that the conditions of travel from Cape Wilkes northward as far at least as Cape Defosse would not differ materially from those already encountered, and enabled me to lay my plans with somewhat greater detail. With the light of the December moon I would proceed to Cape Wilkes with such loads as would enable me to travel steadily without double-banking, advance everything to Cape Lawrence on the north side of Rawlings Bay, then go on to Fort Conger with light sledges, determine the condition of the supplies left there that I might know what I could depend upon, and then return to the ship.

In the January moon I would start with my entire party; move supplies from Cape Lawrence to Fort Conger; remain there till the February moon, the light of which would merge into the beginning of the returning daylight; then sledge the supplies for

the polar journey to Cape Hecla, and be in readiness to start from there with rested and well-fed dogs by the middle of March.

In pursuance of this plan, the two weeks intervening between the departure of the November moon and the appearance of the December one were busily occupied in repairing and strengthening sledges, and making and overhauling clothing and equipment, to enable us to meet this long and arduous journey in the very midnight of the "Great Night." During this interval the temperature much of the time was at −50° F. and below.

December 20, in the first light of the returning moon, I left the *Windward* with my doctor, Henson, four Eskimos and thirty dogs, all that were left of the sixty odd of four months previous. Thick weather, strong winds rushing out of Kennedy Channel, heavy snow and an abominable ice-foot in Rawlings Bay delayed us, and it was not until the 28th that I had all my supplies assembled at Cape Lawrence, on the north side of Rawlings Bay.

Cape Lawrence presented the advantage of two possible routes by which these latter supplies could be reached from Conger, one through Kennedy Channel, which I was about to follow, and the other *via* Archer Fjord and overland. In spite of the delays I felt, on the whole, well satisfied with the work up to the end of the year. I had all my supplies half way to Fort Conger, and had comfortable snow igloos erected at Cape Hawkes, Cape Louis Napoleon, Cape Fraser, Cape Norton Shaw, Cape Wilkes, and Cape Lawrence.

December 29, I started from Cape Lawrence with light sledges for Fort Conger, hoping to make the distance in five days. The first march from Cape Lawrence the ice-foot was fairly good, though an inch or two of efflorescence made the sledges drag as if on sand. The ice-foot grew steadily worse as we advanced, until, after rounding Cape Defosse, it was almost impassable, even for light sledges. The light of the moon lasted only for a few hours out of the twenty-four, and at its best was not sufficient to permit us to select a route on the sea ice.

Just south of Cape Defosse we ate the last of our biscuit, just north of it the last of our beans. On the next march a biting wind swept down the Channel and numbed the Eskimo, who had spent the previous winter in the United States, to such an extent, that, to save him, we were obliged to halt just above Cape Cracroft and dig a burrow in a snowdrift. When the storm ceased, I left him with another Eskimo and nine of the poorer dogs, and pushed on to reach Fort Conger.

The moon had left us entirely now, and the ice-foot was utterly

impracticable, and we groped and stumbled through the rugged sea ice as far as Cape Baird. Here we slept a few hours in a burrow in the snow, then started across Lady Franklin Bay. In complete darkness and over a chaos of broken and heaved-up ice, we stumbled and fell and groped for eighteen hours, till we climbed upon the ice-foot of the north side. Here a dog was killed for food.

Absence of suitable snow put an igloo out of the question, and a semi-cave under a large cake of ice was so cold that we could stop only long enough to make tea. Here I left a broken sledge and nine exhausted dogs. Just east of us a floe had been driven ashore, and forced up over the ice-foot till its shattered fragments lay a hundred feet up the talus of the bluff. It seemed impassable, but the crack at the edge of the ice-foot allowed us to squeeze through; and soon after we rounded the point, and I was satisfied by the "feel" of the shore, for we could see nothing, that we were at one of the entrances of Discovery Harbor, but which, I could not tell.

Several hours of groping showed that it was the eastern entrance. We had struck the centre of Bellot Island, and at midnight of January 6 we were stumbling through the dilapidated door of Fort Conger. A little remaining oil enabled me, by the light of our sledge cooker, to find the range and the stove in the officers' quarters, and, after some difficulty, fires were started in both. When this was accomplished, a suspicious "wooden" feeling in the right foot led me to have my kamiks pulled off, and I found, to my annoyance, that both feet were frosted.

Coffee from an open tin in the kitchen, and biscuit from the table in the men's room, just as they had been dropped over fifteen years ago, furnished the menu for a simple but abundant lunch. A hasty search failing to discover matches, candles, lamps or oil, we were forced to devise some kind of a light very quickly, before our oil burned out. Half a bottle of olive oil, a saucer and a bit of towel furnished the material for a small native lamp, and this, supplemented by pork fat and lard, furnished us light for several days, until oil was located. Throwing ourselves down on the cots in the officers' rooms, after everything had been done for my feet, we slept long and soundly. Awakening, it was evident that I should lose parts or all of several toes, and be confined for some weeks. The mean minimum temperature during the trip was 51.9° F., the lowest 63° F.

During the following weeks our life at Conger was pronouncedly *à la* Robinson Crusoe. Searching for things in the unbroken dark-

ness of the "Great Night," with a tiny flicker of flame in a saucer, was very like seeking a needle in a haystack. Gradually all the essentials were located, while my two faithful Eskimos brought in empty boxes and barrels and broke them up to feed the fire. The dogs left on Bellot Island were brought in, but several died before they got used to the frozen salt pork and beef, which was all I had to feed them. The natives made two attempts to reach and bring in the two men left at Cape Cracroft, but were driven back both times by the darkness and furious winds. Finally, some ten days after we left the dug-out, they reached it again, and found that the two men, after eating some of their dogs, had started for the ship on foot, the few remaining dogs following them.

On the 18th of February, the moonlight and the remaining twilight afforded enough light for a fair day's march in each twenty-four hours; we started for the *Windward*. My toes were unhealed, and I could hardly stand for a moment. I had twelve dogs left, but their emaciated condition and the character of the road precluded riding by any one but myself. Lashed firmly down, with feet and legs wrapped in musk-ox skin, I formed the only load of one sledge. The other carried the necessary provisions.

On the 28th we reached the *Windward*, everyone but myself having walked the entire distance, of not less than 250 miles, in eleven days. Fortunately for us, and particularly for me, the weather during our return, though extremely cold, was calm, with the exception of one day from Cape Cracroft south, during which the furious wind kept us enveloped in driving snow. The mean minimum daily temperature while we were returning was −56.18° F., reaching the lowest, −65° F., the day we arrived at the *Windward*.

March 3. I started one of my Eskimos for Whale Sound with a summons to the hunters there to come to me with their dogs and sledges. Between the 3rd and the 14th, a party of Eskimos coming unexpectedly, the last of the musk-ox meat on Bache Peninsula was brought to the ship, and another bull musk-ox killed.

March 13. The final amputation of my toes was performed. Pending the arrival of more natives, I sent a dory to Cape Louis Napoleon to be cached, and had dog-food and current supplies advanced to Cape Fraser.

March 31, a contingent of five natives and twenty-seven dogs came in. My messenger had been delayed by heavy winds and

rough ice, and the ravages of the dog disease had made it necessary to send to the more southerly settlements for dogs.

April 3, Henson left with these natives and thirty-five dogs, with instructions to move the supplies at Cape Lawrence to Carl Ritter Bay, then push on with such loads as he could carry without double-banking to Fort Conger, rest his dogs and dry his clothing, and if I did not join him by that time to start back.

April 19, my left foot had healed, though it was still too weak and stiff from long disuse for me to move without crutches. On this day I started for Fort Conger with a party of ten, some fifty dogs, and seven sledges, loaded with dog-food and supplies for return caches.

April 23, I met Henson returning with his party at Cape Lawrence. From there I sent back my temporary help and borrowed dogs, and went on with a party of seven, including five natives. April 28 we reached Conger.

May 4. Having dried all our gear and repaired sledges, I started for a reconnoissance of the Greenland northwest coast. I should have started two days earlier but for bad weather. Following the very arduous ice-foot to St. Patrick's Bay, I found the bay filled with broken pack ice covered with snow almost thigh deep. From the top of Cape Murchison, with a good glass, no practicable road could be seen. The following day I sent two men with empty sledges and a powerful team of dogs to Cape Beechey, to reconnoitre from its summit. Their report was discouraging. Clear across to the Greenland shore, and up and down as far as the glass could reach, the channel was filled with upheaved floe fragments, uninterrupted by young ice or large floes, and covered with deep snow.

Crippled as I was, and a mere dead weight on the sledge, I felt that the road was impracticable. Had I been fit and in my usual place, ahead of the sledges breaking the ice with my snow-shoes, it would have been different. One chance remained—that of finding a passage across to the Greenland side at Cape Lieber.

Returning to Fort Conger, I sent Henson and one Eskimo off immediately on this reconnoissance, and later sent two men to Musk Ox Bay to look for musk-oxen. Two days afterward they returned reporting sixteen musk-oxen killed, and Henson came in on the same day, reporting the condition of the channel off Capes Lieber and Cracroft the same as that off Capes Beechey and Murchison, and that they had been unable to get across. I now gave up the Greenland trip, and perhaps it was well that I did so,

as the unhealed place on my right foot was beginning to break down and assume an unhealthy appearance from its severe treatment. As soon as the musk-ox skins and beef were brought in, the entire party, except myself and one Eskimo, went to the Bellows and Black Rock Vale for more musk oxen. Twelve were killed there, and the skins and meat brought to Conger.

Not believing it desirable to kill more musk-oxen, and unable to do any travelling north, I completed the work of securing the meat and skins obtained; getting the records and private papers of the United States Lady Franklin Bay Expedition together; securing as far as possible collections and property; housing material and supplies still remaining serviceable, and making the house more comfortable for the purposes of my party.

May 23. We started for the ship, carrying only the scientific records of the expedition, the private papers of its members, and necessary supplies. I was still obliged to ride continuously. Favored with abundant light and continuously calm weather, and forcing the dogs to their best, the return to the ship was accomplished in six days, arriving there May 29.

During my absence Capt. Bartlett had built at Cape D'Urville, from plans which I furnished him, a comfortable house of the boxes of supplies, double-roofed with canvas, and banked in with gravel.

June 1, I sent one sledge-load of provisions to Cape Louis Napoleon, and four to Cape Norton Shaw. June 6, I sent three loads to Carl Ritter Bay, and two to Cape Lawrence. On the 25th of June, the last of these sledges returned to the *Windward*, and the year's campaign to the north was ended. The return from Carl Ritter Bay had been slow, owing to the abundance of water on the ice-foot and the sea ice of the bays, and the resulting sore feet of the dogs.

June 28, a sufficient number of dogs had recovered from the effect of their work to enable me to make up two teams, and Henson was sent with these, four of the natives and a dory, to make his way to Etah and communicate with the summer ship immediately on her arrival, so that her time would not be wasted even should the *Windward* be late in getting out of the ice.

June 29, I started with two sledges and three natives to complete my survey of Princess Marie and Buchanan Bays, and make a reconnoissance to the westward from the head of the former. My feet, which I had been favoring since my return from Conger, were now in fair condition, only a very small place on the right one remaining unhealed. Travelling and working at night, and sleeping

during the day, I advanced to Princess Marie Bay, crossed the narrow neck of Bache Peninsula, and camped on the morning of July 4th near the head of the northern arm of Buchanan Bay. Hardly was the tent set up when a bear was seen out in the bay, and we immediately went in pursuit, and in a short time had him killed. He proved to be a fine large specimen.

While after the bear, I noticed a herd of musk-oxen a few miles up the valley, and after the bear had been brought into camp and skinned, and we had snatched a few hours' sleep, we went after the musk-oxen. Eight of these were secured, including two fine bulls and two live calves, the latter following us back to camp of their own accord. The next three days were occupied in getting the beef to camp. I then crossed to the southern arm of Buchanan Bay, securing another musk-ox. Returning to Princess Marie Bay, I camped on the morning of the 14th at the glacier, which fills the head of Sawyer Bay.

During the following six days I ascended the glacier, crossed the ice cap to its western side, and, from elevations of from 4,000 to 4,700 feet, looked down upon the snow-free western side of Ellesmere Land, and out into an ice-free fjord, extending some fifty miles to the northwest. The season here was at least a month earlier than on the east side, and the general appearance of the country reminded me of the Whale Sound region of Greenland. Clear weather for part of one day enabled me to take a series of angles, then fog and rain and snow settled down upon us. Through this I steered by compass back to and down the glacier, camping on the 21st in my camp of the 15th.

The return from here to the ship was somewhat arduous, owing to the rotten condition of the one-year ice, and the deep pools and canals of water on the surface of the old floes. These presented the alternative of making endless detours or wading through water often waist deep. During seven days our clothing, tent, sleeping-gear and food were constantly saturated. The *Windward* was reached on the 28th of July.

In spite of the discomforts and hardships of this trip, incident to the lateness of the season, I felt repaid by its results. In addition to completing the notes requisite for a chart of the Princess Marie-Buchanan Bay region, I had been fortunate in crossing the Ellesmere Land ice-cap, and looking upon the western coast. The game secured during this trip comprised 1 polar bear, 7 musk-oxen, 3 oogsook,* and 14 seals.

* Bearded seal.

When I returned to the *Windward* she was round in the eastern side of Franklin Pierce Bay. A party had left two days before with dogs, sledge and boat, in an attempt to meet me and supply provisions. Three days were occupied in communicating with them and getting them and their outfit on board. The *Windward* then moved back to her winter berth at Cape D'Urville, took the dogs on board, and on the morning of Wednesday, August 2, got under way.

During the next five days we advanced some twelve miles, when a southerly wind jammed the ice and drifted us north, abreast of

ETAH, WINTER QUARTERS 1899–1900.

the starting-point. Early Tuesday morning, the 8th, we got another start, and the ice gradually slackening, we kept under way, reached open water a little south of Cape Albert, and arrived at Cape Sabine at 10 P.M.

At Cape Sabine I landed a cache and then steamed over to Etah, arriving at 5 A.M. of the 9th. Here we found mail and learned that the *Diana*, which the Club had sent up to communicate with me, was out after walrus. August 12th the *Diana* returned, and I had the great pleasure of taking Secretary Bridgman, commanding the Club's Expedition, by the hand.

The year had been one of hard and continuous work for the entire party. In that time I obtained the material for an authentic map of the Buchanan Bay-Bache Peninsula-Princess Marie Bay region; crossed the Ellesmere Land Ice-cap to the west side of that land, established a continuous line of caches from Cape Sabine to Fort Conger, containing some fourteen tons of supplies; rescued the original records and private papers of the Greely Expedition; fitted Fort Conger as a base for future work, and familiarized myself and party with the entire region as far north as Cape Beechey.

With the exception of the supplies at Cape D'Urville all the provisions, together with the current supplies and dog-food (the latter an excessive item), had been transported by sledge.

Finally, discouraging as was the accident to my feet, I was satisfied, since my effort to reach the northwest coast of Greenland from Fort Conger in May, that the season was one of extremely unfavorable ice conditions north of Cape Beechey, and I doubt, even if the accident had not occurred, whether I should have found it advisable on reaching Cape Hecla to attempt the last stage of the journey.

My decision not to attempt to winter at Fort Conger was arrived at after careful consideration. Two things controlled this decision: First, the uncertainty of carrying dogs through the winter, and, second, the comparative facility with which the distance from Etah to Fort Conger can be covered with light sledges.

After the rendezvous with the *Diana* I went on board the latter ship and visited all the native settlements, gathering skins and material for clothing and sledge equipment, and recruiting my dog-teams.

The *Windward* was sent walrus-hunting during my absence. The *Diana* also assisted in this work. August 25 the *Windward* sailed for home, followed on the 28th by the *Diana*, after landing me with my party, equipment, and additional supplies at Etah.

The *Diana* seemed to have gathered in and taken with her all the fine weather, leaving us a sequence of clouds, wind, fog, and snow, which continued with scarcely a break for weeks.

After her departure the work before me presented itself as follows: To protect the provisions, construct our winter quarters, then begin building sledges, and grinding walrus meat for dog pemmican for the spring campaign.

During the first month a number of walrus were killed from our boats off the mouth of the fjord; then the usual Arctic winter

settled down upon us, its monotony varied only by the visits of the natives, occasional deer-hunts, and a December sledge journey to the Eskimo settlements in Whale Sound as far as Kangerd-look-soah. In this nine days' trip some 240 miles were covered in six marches, the first and the last marches being of 60 to 70 miles. I returned to Etah just in time to escape a severe snowstorm, which stopped communication between Etah and the other Eskimo settlements completely, until I sent a party with snowshoes and a specially-constructed sledge, carrying no load, and manned by double teams of dogs, to break the trail.

During my absence some of my natives had crossed to Mr. Stein's place at Sabine, and January 9th I began the season's work by starting a few sledge-loads of dog food for Cape Sabine, for use of my teams in the spring journey. From this time on, as the open water in Smith Sound permitted, more dog-food was sent to Sabine, and as the light gradually increased some of my Eskimos were kept constantly at Sonntag Bay, some twenty miles to the south, on the lookout for walrus.

My programme for the spring work was to move three divisions of sledges north as far as Conger, the first to be in charge of Henson; while I brought up the rear with the third.

From Fort Conger I should send back a number of Eskimos; retain some at Conger; and with others proceed north *via* Hecla or the north point of Greenland, as circumstances might determine.

I wanted to start the first division on the 15th of February, the second a week later, and leave with the third March 1st; but a severe storm, breaking up the ice between Etah and Littleton Island, delayed the departure of the first division of seven sledges until the 19th.

The second division of six sledges started on the 26th, and March 4th I left with the rear division of nine sledges. Three marches carried us to Cape Sabine, along the curving northern edge of the north water. Here a northerly gale, with heavy drift, detained me for two days. Three more marches in a temperature of 40° F. brought me to the house at Cape D'Urville. Records here informed me that the first division had been detained here a week by stormy weather, and the second division had left but two days before my arrival. I had scarcely arrived when two of Henson's Eskimos came in from Richardson Bay, where one of them had severely injured his leg by falling under a sledge. One day was spent at D'Urville drying our clothing, and on the 13th

I got away on the trail of the other divisions with seven sledges, the injured man going to Sabine with the supporting party.

I hoped to reach Cape Louis Napoleon on this march, but the going was too heavy, and I was obliged to camp in Dobbin Bay, about five miles short of the cape. The next day I hoped on starting to reach Cape Fraser, but was again disappointed, a severe windstorm compelling me to halt a little south of Hayes Point, and hurriedly build snow igloos in the midst of a blinding drift. All that night and the next day, and the next night, the storm continued. An early start was made on the 16th, and in calm but very thick weather, we pushed on to Cape Fraser. Here we encountered the wind and drift full in our faces, and violent, making our progress from here to Cape Norton Shaw very trying along the ice-foot.

The going from here across Scoresby and Richardson Bays was not worse than the year before; and from Cape Wilkes to Cape Lawrence the same as we had always found it. These two marches were made in clear but bitterly windy weather.

Another severe southerly gale held us prisoners at Cape Lawrence for a day. The 20th was an equally cruel day, with wind still savage in its strength, but the question of food for my dogs gave me no choice but to try to advance. At the end of four hours we were forced to burrow into a snow-bank for shelter, where we remained till the next morning.

In three more marches we reached Cape Leopold von Buch. Two more days of good weather brought us to a point a few miles north of Cape Defosse. Here we were stopped by another furious gale with drifting snow, which prisoned us for two nights and a day.

The wind was still bitter in our faces when we again got under way the morning of the 27th, the ice-foot became worse and worse up to Cape Cracroft, where we were forced down into the narrow tidal joint, at the base of the ice-foot; this path was a very narrow and tortuous one, frequently interrupted, and was extremely trying on men and sledges. Cape Lieber was reached on this march. At this camp the wind blew savagely all night, and in the morning I waited for it to moderate before attempting to cross Lady Franklin Bay. While thus waiting the returning Eskimos of the first and second divisions came in. They brought the very welcome news of the killing of 21 musk-oxen close to Conger. They also reported the wind out in the bay as less severe than at the Cape.

I immediately got under way and reached Conger just before midnight of the 28th—24 days from Etah—during six of which I was held up by storms.

The first division had arrived four days and the second two days earlier. During this journey there had been the usual annoying delays of broken sledges, and I had lost numbers of dogs.

The process of breaking in the tendons and muscles of my feet to their new relations, and the callousing of the amputation scars, in this, the first serious demand upon them, had been disagreeable, but was, I believed, final and complete. I felt that I had no reason to complain.

The herd of musk-oxen so opportunely secured near the station, with the meat cached here the previous spring, furnished the means to feed and rest my dogs. A period of thick weather followed my arrival at Conger, and not until April 2d could I send back the Eskimos of my division.

On leaving Etah I had not decided whether I should go north from Conger *via* Cape Hecla, or take the route along the northwest coast of Greenland. Now I decided upon the latter. The lateness of the season and the condition of the dogs might militate against a very long journey; and if I chose the Hecla route and failed of my utmost aims, the result would be complete failure. If, on the other hand, I chose the Greenland route and found it impossible to proceed northward over the pack, I still had an unknown coast to exploit, and the opportunity of doing valuable work. Later developments showed my decision to be a fortunate one.

I planned to start from Conger the 9th of April, but stormy weather delayed the departure until the 11th, when I got away with seven sledges.

At the first camp beyond Conger my best Eskimo was taken sick, and the following day I brought him back to Conger, leaving the rest of the party to cross the channel to the Greenland side, where I would overtake them. This I did two or three days later, and we began our journey up the northwest Greenland coast. As far as Cape Sumner we had almost continuous road-making through very rough ice. Before reaching Cape Sumner we could see a dark water sky, lying beyond Cape Brevoort, and knew that we should find open water there.

From Cape Sumner to Polaris Boat Camp, in Newman Bay, we cut a continuous road. Here we were stalled until the 21st by continued and severe winds. Getting started again in the tail end of the storm, we advanced as far as the open water, a few miles east of Cape Brevoort, and camped. This open water, about three miles wide at the Greenland end, extended clear across the mouth of Robeson Channel to the Grinnell Land coast, where it reached

from Lincoln Bay to Cape Rawson. Beyond it, to the north and northwest, as far as could be seen, were numerous lanes and pools. The next day was devoted to hewing a trail along the ice-foot to Repulse Harbor, and on the 23d, in a violent gale, accompanied by drift, I pushed on to the "Drift Point" of Beaumont (and later Lockwood), a short distance west of Black Horn Cliffs.

The ice-foot as far as Repulse Harbor, in spite of the road-making of the previous day, was very trying to sledges, dogs, and men. The slippery side slopes, steep ascents and precipitous descents wrenched and strained the men, and capsized, broke, and ripped shoes from the sledges.

I was not surprised to see from the "Drift Point" igloo that the Black Horn Cliffs were fronted by open water. The pack was in motion here, and had only recently been crushing against the ice-foot, where we built our igloo. I thought I had broken my feet in pretty thoroughly on the journey from Etah to Conger; but this day's work of handling a sledge along the ice-foot made me think they had never encountered any serious work before. A blinding snowstorm on the 24th kept us inactive. The next day I made a reconnoissance to the cliffs, and the next set the entire party to work hewing a road along the ice-foot. That night the temperature fell to 25° F., forming a film of young ice upon the water. The next day I moved up close to the cliffs, and then with three Eskimos reconnoitred the young ice. I found that by proceeding with extreme care it would in most places support a man.

With experienced Ahsayoo ahead, constantly testing the ice with his seal spear, myself next, and two Eskimos following, all with feet wide apart, and sliding instead of walking, we crept past the cliffs. Returning we brushed the thin film of newly-fallen snow off the ice with our feet, for a width of some four feet, to give the cold free access to it.

I quote from my diary for the 27th:

> At last we are past the barrier which has been looming before me for the last ten days—the open water at the Black Horn Cliffs. Sent two of my men, whose nerves are disturbed by the prospect ahead, back to Conger. This leaves me with Henson and three Eskimos. My supplies can now be carried on the remaining sledges. Still further stiffened by the continuous low temperature of the previous night, the main sheet of new ice in front of the cliffs was not hazardous, as long as the sledges kept a few hundred feet apart, did not stop, and their drivers kept some yards away to one side. Beyond the limit of my previous day's reconnoissance there were areas of much younger ice, which caused me considerable apprehension, as it buckled to a very disquieting extent beneath dogs and sledges, and, from the motion of the outside pack, was crushed up in places, while narrow cracks opened up in others. Finally, to my relief, we reached the ice-foot beyond the cliffs and camped.

The next day there was a continuous lane of water, 100 feet wide, along the ice-foot by our camp, and the space in front of the cliffs was again open water. We crossed just in time.

Up to Cape Stanton we had to hew a continuous road along the foot-ice. After this the going was much better to Cape Bryant. Off this section of the coast the pack was in constant motion, and an almost continuous lane of water extended along the ice-foot. A long search at Cape Bryant finally discovered the remains of Lockwood's cache and cairn, which had been scattered by bears. Three marches, mostly in thick weather, and over alternating hummocky blue ice and areas of deep snow, brought us at 1 A. M. of May 4th to Cape North (the northern point of Cape Britannia Island). From this camp, after a sleep, I sent back two more Eskimos and the twelve poorest dogs, leaving Henson, one Eskimo, and myself, with three sledges and sixteen dogs, for the permanent advance party.

From Cape North a ribbon of young ice on the so-called tidal crack, which extends along this coast, gave us a good lift nearly across Nordenskjold Inlet. Then it became unsafe, and we climbed a heavy rubble barrier to the old floe ice inside, which we followed to Cape Benét, and camped. Here we were treated to another snowstorm.

Another strip of young ice gave us a passage nearly across Mascart Inlet, until, under Cape Payer, I found it so broken up that two of the sledges and nearly all of the dogs got into the water before we could escape from it. Then a pocket of snow, thigh and waist deep, over rubble ice under the lee of the Cape stalled us completely. I pitched the tent, fastened the dogs, and we devoted the rest of the day to stamping a road through the snow with our snow shoes. Even then, when we started the next day I was obliged to put two teams to one sledge in order to move it.

Cape Payer was a hard proposition. The first half of the distance round it we were obliged to cut a road, and on the latter half, with twelve dogs and three men to each sledge to push and pull them, snowplow fashion, through the deep snow.

Distant Cape was almost equally inhospitable, and it was only after long and careful reconnoissance that we were able to get our sledges past along the narrow crest of the huge ridge of ice forced up against the rocks. After this we had comparatively fair going, on past Cape Ramsay, Dome Cape, and across Meigs Fjord, as far as Mary Murray Island. Then came some heavy going, and at 11.40 P. M. of May 8th we reached Lockwood's cairn on the north

end of Lockwood Island. From this cairn I took the record and thermometer deposited there by Lockwood eighteen years before. The record was in a perfect state of preservation.

One march from here carried us to Cape Washington. Just at midnight we reached the low point, which is visible from Lockwood Island, and great was my relief to see, on rounding this point, another splendid headland, with two magnificent glaciers debouching near it, rising across an intervening inlet. I knew now that Cape Washington was not the northern point of Greenland, as I had feared. It

LATERAL RIVER, BENEDICT GLACIER.

would have been a great disappointment to me, after coming so far, to find that another's eyes had forestalled mine in looking first upon the coveted northern point.

Nearly all my hours for sleep at this camp were taken up by observations and a round of angles. The ice north from Cape Washington was in a frightful condition—utterly impracticable. Leaving Cape Washington we crossed the mouth of the fjord, packed with blue top floe-bergs, to the western edge of one of the big glaciers, and then over the extremity of the glacier itself, camping near the edge of the second. Here I found myself in the midst of the birth-

place of the "floe-bergs," which could be seen in all the various stages of formation. These "floe-bergs" are merely degraded ice-bergs; that is, bergs of low altitude, detached from the extremity of a glacier, which has for some distance been forcing its way along a comparatively level and shallow sea bottom.

From this camp we crossed the second glacier, then a small fjord, where we killed a polar bear.

It was evident to me now that we were very near the northern extremity of the land; and when we came within view of the next point ahead I felt that my eyes rested at last upon the Arctic Ultima Thule (Cape Morris K. Jesup). The land ahead also impressed me at once as showing the characteristics of a musk-ox country.

This point was reached in the next march, and I stopped to take variation and latitude sights. Here my Eskimo shot a hare, and we saw a wolf track and traces of musk-oxen. A careful reconnoissance of the pack to the northward, with glasses, from an elevation of a few hundred feet, showed the ice to be of a less impracticable character than it was north of Cape Washington. What were evidently water clouds showed very distinctly on the horizon. This water sky had been apparent ever since we left Cape Washington, and at one time assumed such a shape that I was almost deceived into taking it for land. Continued careful observation destroyed the illusion. My observations completed, we started northward over the pack, and camped a few miles from land.

The two following marches were made in a thick fog, through which we groped our way northward, over broken ice and across gigantic, wavelike drifts of hard snow. One more march in clear weather over frightful going—consisting of fragments of old floes; ridges of heavy ice thrown up to heights of twenty-five to fifty feet; crevasses and holes, masked by snow; the whole intersected by narrow leads of open water—brought us at 5 A. M. on the 16th of May to the northern edge of a fragment of an old floe bounded by water. A reconnoissance from the summit of a pinnacle of the floe, some fifty feet high, showed that we were on the edge of the disintegrated pack, with a dense water sky not far distant.

My hours for sleep at this camp were occupied in observations, and making a transit profile of the northern coast from Cape Washington eastward.

The next day I started back for the land, reached it in one long march and camped.

Within a mile of our next camp a herd of fifteen musk-oxen lay

fast asleep; I left them undisturbed. From here on, for three marches, we made great distances over good going, in blinding sunshine, and in the face of a wind from the east which burned our faces like a sirocco.

The first march took us to a magnificent cape (Cape Bridgman), at which the northern face of the land trends away to the southeast. This cape is in the same latitude as Cape Washington. The next two carried us down the east coast to the 83d parallel. In the first of these we crossed the mouth of a large fjord penetrating for a long distance in a southwesterly (true) direction. On the next, in a fleeting glimpse through the fog, I saw a magnificent mountain of peculiar contour, which I recognized as the peak seen by me in 1895, from the summit of the interior ice-cap south of Independence Bay, rising proudly above the land to the north. This mountain was then named by me Mt. Wistar. Finally the density of the fog compelled a halt on the extremity of a low point, composed entirely of fine glacial drift, and which I judged to be a small island in the mouth of a large fjord.

From my camp of the previous night I had observed this island (?) and beyond and over it a massive block of a mountain, forming the opposite cape of a large intervening fjord, and beyond that again another distant cape. Open water was clearly visible a few miles off the coast, while not far out dark water clouds reached away to the southeast.

At this camp I remained two nights and a day, waiting for the fog to lift. Then, as there seemed to be no indication of its doing so, and my provisions were exhausted, I started on my return journey at 3.30 A. M. on the 22d of May, after erecting a cairn, in which I deposited the following record:

COPY OF RECORD IN CAIRN AT CLARENCE WYCKOFF ISLAND.

Arrived here at 10.30 P. M., May 20, from Etah via Fort Conger, and north end of Greenland. Left Etah March 4th. Left Conger April 15th. Arrived north end of Greenland May 13th. Reached point on sea-ice latitude 83 degrees 50′ N., May 16th.

On arrival here had rations for one more march southward. Two days dense fog have held me here. Am now starting back.

With me are my man Mathew Henson; Ahngmâlokto, an Eskimo; sixteen dogs and three sledges.

This journey has been made under the auspices of and with funds furnished by the Peary Arctic Club of New York City.

The membership of this Club comprises Morris K. Jesup, Henry W. Cannon, Herbert L. Bridgman, John Flagler, E. C. Benedict, James J. Hill, H. H. Bene-

dict, Fredk. E. Hyde, E. W. Bliss, H. H. Sands, J. M. Constable, C. F. Wyckoff, E. G. Wyckoff, Chas. P. Daly, Henry Parish, A. A. Raven, G. B. Schley, E. B. Thomas, and others.

R. E. PEARY,
Civil Engineer U. S. N.

The fog kept company with us on our return almost continuously until we had passed Lockwood Island, but as we had a trail to follow, did not delay us as much as the several inches of heavy snow that fell in a blizzard, which came from the polar basin, and imprisoned us for two days at Cape Bridgman.

CAPE MORRIS K. JESUP, MOST NORTHERLY KNOWN LAND.

At Cape Morris K. Jesup, the northern extremity, I erected a prominent cairn, in which I deposited the following record:

COPY OF RECORD IN NORTH CAIRN.

May 13, 1900—5 A.M.

Have just reached here from Etah via Ft. Conger. Left Etah March 4th. Left Conger April 15th. Have with me my man Henson, an Eskimo Ahngmalokto, 16 dogs and three sledges; all in fair condition. Proceed to-day due North (true) over sea-ice. Fine weather. I am doing this work under the auspices of and with funds furnished by the Peary Arctic Club of New York City.

The membership of this Club comprises, Morris K. Jesup; Henry W. Cannon; Herbert L. Bridgman; John H. Flagler; E. C. Benedict; Fred'k E. Hyde; E. W.

Bliss; H. H. Sands; J. M. Constable; C. F. Wyckoff; E. G. Wyckoff; Chas. P. Daly; Henry Parish; A. A. Raven; E. B. Thomas and others.

R. E. PEARY,
Civil Engineer, U. S. N.

May 17.

Have returned to this point. Reached 83 degrees 50′ N. lat. due north of here. Stopped by extremely rough ice, intersected by water cracks. Water sky to north. Am now going east along the coast. Fine weather.

May 26.

Have again returned to this place. Reached point on East Coast about N. Lat. 83 degrees. Open water all along the coast a few miles off. No land seen to north or east. Last seven days continuous fogs, wind and snow. Is now snowing, with strong westerly wind. Temperature 20° F. Ten musk-oxen killed east of here. Expect start for Conger tomorrow.

At Cape Washington, also, I placed a copy of Lockwood's record, from the cairn at Lockwood Island, with the following indorsement:

This copy of the record left by Lieut. J. B. Lockwood and Sergt. (Now Colonel) D. L. Brainard U. S. A. in the cairn on Lockwood Island southwest of here May 16, 1882, is to-day placed by me in this cairn on the farthest land seen by them, as a tribute to two brave men, one of whom gave his life for his Arctic work.

May 29, 1900.

For a few minutes on one of the marches the fog lifted, giving us a magnificent panorama of the north coast mountains. Very sombre and savage they looked, towering white as marble with the newly fallen snow, under their low, threatening canopy of lead-colored clouds. Two herds of musk-oxen were passed, one of fifteen and one of eighteen, and two or three stragglers. Four of these were shot for dog-food, and the skin of one, killed within less than a mile of the extreme northern point, has been brought back as a trophy for the Club.

Once free of the fog off Mary Murray Island we made rapid progress, reaching Cape North in four marches from Cape Washington. Clear weather showed us the existence of open water a few miles off the shore, extending from Dome Cape to Cape Washington. At Black Cape there was a large open water reaching from the shore northward. Everywhere along this coast I was impressed by the startling evidence of the violence of the blizzard of a few days before. The polar pack had been driven resistlessly in against the iron coast, and at every projecting point had risen to the crest of the ridge of old ice, along the outer edge of the ice-foot, in a terrific cataract of huge blocks. In places these mountains of shat-

tered ice were 100 feet or more in height. The old ice in the bays and fjords had had its outer edge loaded with a great ridge of ice fragments, and was itself cracked and crumpled into huge swells by the resistless pressure. All the young ice which had helped us on our onward passage had been crushed into countless fragments and swallowed up in the general chaos.

Though hampered by fog, the passage from Cape North to Cape Bryant was made in twenty-five and one-half marching hours. At seven A.M. of the 6th of June we camped on the end of the ice-foot, at the eastern end of Black Horn Cliffs. A point a few hundred feet up the bluffs, commanding the region in front of the cliffs, showed it to be filled by small pieces of old ice, held in place against the shore by pressure of the outside pack. It promised at best the heaviest kind of work, with the certainty that it would run abroad at the first release of pressure.

The next day, when about one-third the way across, the ice did begin to open out, and it was only after a rapid and hazardous dash from cake to cake that we reached an old floe, which, after several hours of heavy work, allowed us to climb upon the ice-foot of the western end of the Cliffs.

From here on rapid progress was made again, three more marches taking us to Conger, where we arrived at 1.30 A.M., June 10, though the open water between Repulse Harbor and Cape Brevoort, which had now expanded down Robeson Channel to a point below Cape Sumner, and the rotten ice under Cape Sumner, hampered us seriously. In passing I took copies of the Beaumont English Records from the cairn at Repulse Harbor, and brought them back for the archives of the Club. They form one of the finest chapters of the most splendid courage, fortitude and endurance, under dire stress of circumstances, that is to be found in the history of Arctic explorations.

In this journey I had determined, conclusively, the northern limit of the Greenland Archipelago or land group, and had practically connected the coast southward to Independence Bay, leaving only that comparatively short portion of the periphery of Greenland lying between Independence Bay and Cape Bismarck indeterminate. The non-existence of land, for a very considerable distance to the northward and northeastward, was also settled, with every indication pointing to the belief that the coast along which we travelled formed the shore of an uninterrupted central Polar sea, extending to the Pole, and beyond to the Spitzbergen and Franz Josef Land groups of the opposite hemisphere.

The origin of the floe-bergs and paleocrystic ice was definitely determined. Further than this, the result of the journey was to eliminate this route as a desirable or practicable one by which to reach the Pole. The broken character of the ice, the large amount of open water, and the comparatively rapid motion of the ice, as it swung round the northern coast into the southerly setting East Greenland current, were very unfavorable features.

During my absence some thirty-three musk-oxen and ten seals had been secured in the vicinity of Conger; caches for my return had been established at Thank God Harbor, Cape Lieber, and Lincoln Bay, and sugar, milk and tea had been brought up from the various caches between Conger and Cape Louis Napoleon.

July was passed by a portion of the party in the region from Discovery Harbor westward, *via* Black Rock Vale and Lake Hazen, where some forty musk-oxen were secured.

During August and early September various other hunting trips of shorter duration were made, resulting in the killing of some twenty musk-oxen.

1900–1901.

In the middle of September I started with Henson and four Eskimos to Lake Hazen, to secure musk-oxen for our winter supply, it being evident that my ship would not reach us. Going west as far as the valley of the Very River, by October 4, ninety-two musk-oxen had been killed. Later nine more were secured, making a total of one hundred and one for the autumn hunting.

From the beginning of November to March 6th, the greater portion of the time was passed by my party in igloos built in the vicinity of the game killed in various localities, from Discovery Harbor to Ruggles River.

April 5th I left Conger with Henson, one Eskimo, two sledges and twelve dogs for my northern trip. At the same time the remainder of the party, with two sledges and seven dogs and pups, started south for Capes D'Urville and Sabine, to communicate with or obtain tidings of my ship. On reaching Lincoln Bay it was evident to me that the condition of men and dogs was such as to negative the possibility of reaching the Pole, and I reluctantly turned back.

Arriving at Conger, after an absence of eight days, I found the remainder of my party there. They had returned after an absence of four days, having proceeded one-third of the distance across Lady Franklin Bay. Fortunately, the night before I arrived, one

of the Eskimos secured several musk-oxen above St. Patrick's Bay, which enabled me to feed my dogs before starting south, which I did with the entire party on April 17.

April 30, at Hayes Point, I met the party from the *Windward* attempting to reach Conger, and received my mail, learning that the *Windward* was at Payer Harbor with Mrs. Peary and our little girl on board. After a rest at the D'Urville box-house, I went on to the *Windward*, arriving May 6th.

After a few days' rest the work of establishing new caches along the coast northward, towards Conger, was commenced and continued until the middle of June. Then the preparing of Payer Harbor for winter quarters was carried on till July 3d, when the *Windward* broke out of the ice and steamed over to the Greenland side. July was devoted to killing walrus, and 128 were secured and transported to Payer Harbor.

August 4th, the *Erik*, sent up by the Club, in command of Secretary H. L. Bridgman, to communicate with me, arrived at Etah. The usual tour of visits to the Eskimo settlements was then made, and both ships pressed into the work of hunting walrus, until August 24th, when the *Windward* proceeded southward, and the *Erik* steamed away to land me and my party and the catch of walrus at Payer Harbor.

A large quantity of heavy ice blocking the way to Payer Harbor, I requested Secretary Bridgman to land me and my party and walrus meat, in a small bight, some twelve or fifteen miles south of Cape Sabine, from whence I could proceed to Payer Harbor in my boats or sledges when opportunity offered. This was done, and on the 29th of August the *Erik* steamed away.

1901–1902.

On the 16th of Sept. I succeeded in reaching Payer Harbor, crossing Ross Bay, partly by sledge and partly by boat, and going overland across Bedford Pim Island.

Soon after this my Eskimos began to sicken, and by November 19th six of them were dead. During this time I personally sledged much of the material from Erik Harbor to headquarters, and Henson went to the head of Buchanan Bay with some of the Eskimos, and secured ten musk-oxen.

The winter passed quietly and comfortably. Two more musk-oxen were secured in Buchanan Bay, and six deer at Etah.

January 2nd, work was begun in earnest on preparations for the spring campaign, which opened on the 11th of February. On this

day I sent off six sledges, with light loads, to select a road across the mouth of Buchanan Bay, and build an igloo abreast of Cape Albert. On the 12th I sent two of my best hunters on a flying reconnoissance and bear hunt, in the direction of Cape Louis Napoleon.

On the 13th eight sledges went out, taking dog food nearly to Cape D'Urville. On the 16th my two scouts returned with a favorable report, and on the 18th ten sledges went out loaded with dog-food to be taken to Cape Louis Napoleon. This party returned on the 22nd. On the evening of the 28th everything was in readiness for Henson to start the next day, it being my intention to send him on ahead with three picked men and light loads to pioneer the way to Conger; I to follow a few days later with the main party. A northerly gale delayed his departure until the morning of March 3rd, when he got away with six sledges and some fifty dogs. Two of these sledges were to act as a supporting party as far as Cape Lawrence. At nine A.M. of March 6th fourteen sledges trailed out of Payer Harbor and rounded Cape Sabine for the northern journey, and at noon I followed them, with my big sledge, the "Long Serpent," drawn by ten fine grays. Two more sledges accompanied me. The temperature at the time was $-20°$ F. The minimum of the previous night had been $-38°$ F. We joined the others at the igloos abreast of Cape Albert and camped there for the night. Temperature $-43°$ F. The next day we made Cape D'Urville in temperature from $-45°$ to $-49°$ F.

Here I stopped a day to dry our foot gear thoroughly, and left on the morning of the 9th with some supplies from the box house. Two sledges returned from here. Camped about five miles from Cape Louis Napoleon. The next march carried me to Cape Fraser, and the next to Cape Collinson. During this march, for the first time in the four seasons that I have been over this route, I was able to take a nearly direct course across the mouth of Scoresby Bay, instead of making a long detour into it.

One march from Cape Collinson carried me to Cape Lawrence, on the north side of Rawlings Bay. The crossing of this bay, though more direct than usual, was over extremely rough ice. Learning from Henson's letter at Cape Lawrence, that I had gained a day on him, and not wanting to overtake him before reaching Conger, I remained here a day, repairing several sledges which had been damaged in the last march. Five men with the worst sledges and poorest dogs returned from here. Three more marches took us to Cape L. von Buch on the north side of Carl

Ritter Bay, temperature ranging from −35° to −45° F. Heavy going in many places.

Two more marches carried us to the first coast valley north of Cape Defosse. I had now gained two days on the advance party. The character of the channel ice being such that we were able to avoid the terrible ice-foot, which extends from here to Cape Lieber, and my dogs being still in good condition, I made a spurt from here and covered the distance to Conger in one march, arriving about an hour and a half after Henson and his party.

I had covered the distance from Payer Harbor to Conger, some 300 miles, in twelve marches.

Four days were spent at Conger overhauling sledges and harness, drying and repairing clothing, and scouting the country, as far as The Bellows, in search of musk-oxen. None were seen, but about 100 hare were secured in the four days. Temperature during this time from −40° to −57° F. Seven Eskimos returned from here, taking with them the instruments of the Lady Franklin Bay Expedition, and other items of Government property abandoned here in 1883.

On the morning of the 24th I started north with nine sledges. We camped the first night at "Depot B." The next march I had counted on making Lincoln Bay, but just before reaching Wrangel Bay a sudden furious gale with blinding drift drove us into camp at the south point of the bay. Here we were storm-bound during the 26th, but got away on the morning of the 27th and pushed on to Cape Union, encountering along this portion of the coast the steep side slopes of hard snow, which are so trying to men and sledges and dogs.

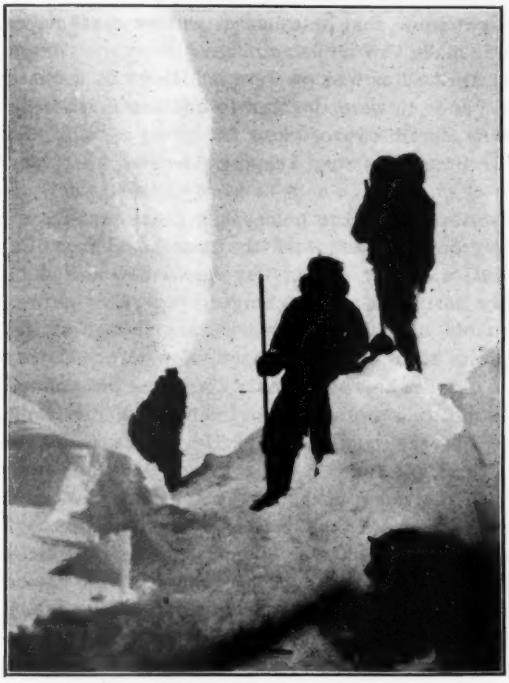
Open water, the clouds over which we saw from Wrangel Bay Camp, was about 100 yards beyond our igloo, and extended from there, as I judged, northward beyond Cape Rawson, and reached entirely across the channel to the Greenland coast at Cape Brevoort, as in 1900.

Fortunately, with the exercise of utmost care, and at the expense of a few narrow escapes, and incessant hard work, we were able to work our sledges along the narrow and dangerous ice-foot to and around Black Cape.

The ice-foot along this section of the coast was the same as was found here by Egerton and Rawson in 1876, and Pavy in 1882, necessitating the hewing of an almost continuous road; but a party of willing, light-hearted Eskimos makes comparatively easy work of what would be a slow and heartbreaking job for two or three

white men. Beyond Black Cape the ice-foot improved in character, and I pushed along to camp at the *Alert's* winter quarters. Simultaneously with seeing the *Alert's* cairn three musk-oxen were seen a short distance inland, and secured. The animals were very thin and furnished but a scant meal for my dogs.

One march from here carried us to Cape Richardson, and the next under the lee of View Point, where we were stopped and



HEWING A WAY.

driven to build our igloo with all possible speed by one of the common Arctic gales. There were young ice, pools of water, and a nearly continuous water sky all along the shore.

As the last march had been through deep snow, I did not dare to attempt the English short cut across Feilden Peninsula behind Cape Joseph Henry, preferring to take the ice-foot route round it.

For a short distance this was the worst bit of ice-foot I have ever encountered. By the slipping of my sledge two men nearly

lost their lives, saving themselves by the merest chance, with their feet already dangling over the crest of a vertical face of ice some fifty feet in height. At the very extremity of the cape we were forced to pass our sledges along a shelf of ice less than three feet in width, glued against the face of the cliff at an elevation which I estimated at the time as seventy-five feet above the ragged surface of the floe beneath. On the western side of the cape the ice-foot broadened and became nearly level, but was smothered in such a depth of light snow that it stalled us and we went into camp. The next day we made Crozier Island.

During April 2d and 3d we were held here by a westerly storm, and the 4th and 5th were devoted to hunting musk-oxen, of which three were secured, two of them being very small. From here I sent back three Eskimos, keeping Henson and four Eskimos with me.

Reconnoissances of the polar pack northward were made with the glasses from the summit of the island and from Cape Hecla.

The pack was very rough, but apparently not as bad as that which I saw north of Cape Washington two years before. Though unquestionably difficult, it yet looked as though we might make some progress through it unless the snow was too deep and soft. This was a detail which the glasses could not determine.

On the morning of April 6th I left Crozier Island, and a few hours later, at the point of Cape Hecla, we swung our sledges sharply to the right and climbed over and down the parapet of the ice-foot onto the polar pack. As the sledges plunged down from the ice-foot their noses were buried out of sight, the dogs wallowed belly deep in the snow, and we began our struggle due northward.

We had been in the field now just a month. We had covered not less than 400 miles of the most arduous travelling in temperatures of from 35° to 57° F., and we were just beginning our work, *i. e.*, the conquest of the polar pack, the toughest undertaking in the whole expanse of the Arctic region.

Some two miles from the cape was a belt of very recent young ice, running parallel with the general trend of the coast. Areas of rough ice caught in this compelled us to exaggerated zigzags, and doubling on our track. It was easier to go a mile round, on the young ice, than to force the sledge across one of these islands.

The northern edge of the new ice was a high wall of heavily-rubbled old ice, through which, after some reconnoissance, we found a passage to an old floe, where I gave the order to build an igloo. We were now about five miles from the land.

The morning of the 7th brought us fine weather. Crossing the old floe we came upon a zone of old floe fragments deeply blanketed with snow. Through the irregularities of this we struggled; the dogs floundering, almost useless, occasionally one disappearing for a moment; now treading down the snow round a sledge to dig it out of a hole into which it had sunk, now lifting the sledges bodily over a barrier of blocks; veering right and left; doubling in our track; road-making with snow-shoe and pickaxe.

Late in the day a narrow ditch gave us a lift for a short distance, then one or two little patches of level going, then two or three small old floes which, though deep with snow, seemed like a Godsend compared with the wrenching earlier work. We camped in the lee of a large hummock on the northern edge of a small but very heavy old floe, every one thoroughly tired, and the dogs dropping motionless in the snow as soon as the whip stopped.

We were now due north of Hecla, and I estimated we had made some six miles, perhaps seven, perhaps only five. A day of work like this makes it difficult to estimate distances. This is a fair sample of our day's work.

On the 12th we were storm-bound by a gale from the west, which hid even those dogs fastened nearest to the igloo. During our stay here the old floe on which we were camped split in two with a loud report, and the ice cracked and rumbled and roared at frequent intervals.

In the first march beyond this igloo we were deflected westward by a lead of practically open water, the thin film of young ice covering it being unsafe even for a dog. A little further on a wide canal of open water deflected us constantly to the northwest and then west until an area of extremely rough ice prevented us from following it farther. Viewed from the top of a high pinnacle this area extended west and northwest on both sides of the canal, as far as could be seen. I could only camp and wait for this canal, which evidently had been widened (though not newly formed) by the storm of the day before, to close up or freeze over. During our first sleep at this camp there was a slight motion of the lead, but not enough to make it practicable. From here I sent back two more Eskimos.

Late in the afternoon of the 14th the lead began to close, and hastily packing the sledges we hurried them across over moving fragments of ice. We now found ourselves in a zone of high parallel ridges of rubble ice covered with deep snow. These ridges were caused by successive opening and closing of the lead. When,

after some time, we found a practicable pass through this barrier, we emerged upon a series of very small but extremely heavy and rugged old floes; the snow on them still deeper and softer than on the southern side of the lead. At the end of a sixteen-hour day I called a halt, though we were only two or three miles north of the big lead.

During the first portion of the next march we passed over fragments of very heavy old floes slowly moving eastward. Frequently we were obliged to wait for the pieces to crush close enough together to let us pass from one to the other. Farther on I was compelled to bear away due east by an impracticable area extending west, northwest, north and northeast as far as could be seen, and just as we had rounded this and were bearing away to the north again, we were brought up by a lead some fifty feet wide. From this on, one day was much like another, sometimes doing a little better, sometimes a little worse, but the daily advance, in spite of our best efforts, steadily decreasing. Fog and stormy weather also helped to delay us.

I quote from my journal for April 21st:

> The game is off. My dream of sixteen years is ended. It cleared during the night and we got under way this morning. Deep snow. Two small old floes. Then came another region of old rubble and deep snow. A survey from the top of a pinnacle showed this extending north, east and west, as far as could be seen. The two old floes, over which we had just come, are the only ones in sight. It is impracticable and I gave the order to camp. I have made the best fight I knew. I believe it has been a good one. But I cannot accomplish the impossible.

A few hours after we halted there came from the ice to the north a sound like that made by a heavy surf, and it continued during our stay at this camp. Evidently the floes in that direction were crushing together under the influence of the wind, or what was, perhaps, more probable, from the long continuation of the noise, the entire pack was in slow motion to the east. A clear day enabled me to get observations which showed my latitude to be 84 degrees 17′ 27″ N., magnetic variation 99° west. I took some photographs of the camp, climbed and floundered through the broken fragments and waist-deep snow for a few hundred yards north of the camp, gave the dogs a double ration, then turned in to sleep, if possible, for a few hours preparatory to returning.

We started on our return soon after midnight of the 21st. It was very thick, with wind from the west and snowing heavily. I hurried our departure in order to utilize as much of our tracks as possible before they were obliterated. It was very difficult to keep the trail in the uncertain light and driving snow. We lost it re-

peatedly, when we would be obliged to quarter the surface like bird dogs. On reaching the last lead of the upward march, instead of the open water which had interrupted our progress then, our tracks now disappeared under a huge pressure ridge, which I estimated to be from seventy-five to one hundred feet high. Our trail was faulted here by the movement of the floes, and we lost time in picking it up on the other side. This was to me a trying march. I had had no sleep the night before, and to the physical strain of handling my sledge was added the mental tax of trying to keep the trail. When we finally camped, it was only for a few

CAMP AT 84° 17′ N. LAT., APRIL 21, 1902.

hours, for I recognized that the entire pack was moving slowly, and that our trail was everywhere being faulted and interrupted by new pressure ridges and leads, in a way to make our return march nearly, if not quite, as slow and laborious as the outward one. The following marches were much the same. In crossing one lead I narrowly escaped losing two sledges and the dogs attached to them. Arrived at the "Grand Canal," as I called the big lead at which I had sent two Eskimos back, the changes had been such as to make the place almost unrecognizable.

Two marches south of the Grand Canal the changes in the ice

had been such, between the time of our upward trip and the return of my two men from the canal, that they, experienced as they were in all that pertains to ice-craft, had been hopelessly bewildered and wandered apparently, for at least a day, without finding the trail. After their passage other changes had taken place, and, as a result, I set a compass course for the land, and began making a new road. In the next march we picked up our old trail again.

Early in the morning of the 22d, we reached the second igloo out from Cape Hecla, and camped in a driving snowstorm. At this igloo we were storm-bound during the 27th and 28th, getting away on the 29th in the densest fog, and bent on butting our way in a "bee" line compass course, for the land. Floundering through the deep snow and ice, saved from unpleasant falls only by the forewarning of the dogs, we reached Crozier Island after a long and weary march. The band of young ice along the shore had disappeared, crushed up into confused ridges and mounds of irregular blocks.

The floe at the island camp had split in two, the crack passing through our igloo, the halves of which stared at each other across the chasm. This march finished two of my dogs, and three or four more were apparently on their last legs. We did not know how tired we were until we reached the island. The warm foggy weather and the last march together dropped our physical barometer several degrees.

As we now had light sledges, I risked the short cut across the base of Feilden Peninsula and camped that night under the lee of View Point. Four more marches carried us to Conger, where we remained three days, drying clothing and repairing sledges, and giving the dogs a much-needed rest. Leaving Conger on the 6th of May, eleven marches brought us back to Payer Harbor on the 17th of May. A few days after this I went north to complete the survey of the inner portions of Dobbin Bay, being absent from headquarters some ten days. Open water vetoing a trip which I had planned for June up Buchanan Bay and across to the west coast of Ellesmere Land, the remainder of the time was devoted to assiduous hunting, in order to secure a supply of meat for the winter, in the contingency of no ship arriving.

On the 5th of August the new *Windward*, sent north by the Club, and bringing to me Mrs. Peary and my little girl, steamed into the harbor. As soon as people and supplies could be hurried aboard her, she steamed across the Sound to the Greenland side. Here my faithful Eskimos were landed, and, after devoting a week

or so to the work of securing sufficient walrus to carry them in comfort through the winter, the *Windward* steamed southward, and, after an uneventful voyage, arrived at Sydney, C. B., on the 17th of September, where I had the pleasure of meeting Secretary Bridgman, of the Club, and forwarding through him a brief report of my movements during the past year.

R. E. PEARY, C.E., U.S.N.

MEMORANDUM.—The Peary Arctic Club, an unincorporated association of contributors to the expedition of 1898–1902, met for the first time at 44 Pine street, New York, January 29, 1899, and having before it Commander Peary's letters and reports from Etah, North Greenland, August 12, 1898, the date of the separation of its steamers Hope and Windward, elected the following officers: President, Morris K. Jesup; Vice-President, Frederick E. Hyde; Treasurer, Henry W. Cannon; Secretary, Herbert L. Bridgman. The constitution, the first three sections of which are as follows, the others being merely of routine common to all similar bodies, was adopted:

I.—The name of the association shall be "The Peary Arctic Club."

II.—The objects of the club are to promote and encourage explorations of the Polar regions, as set forth in Lieutenant R. E. Peary's letter to the American Geographical Society, dated January 14, 1897, and to assist him in the geography of the same; to receive and collect such objects of scientific interest, or otherwise, as may be obtainable through Lieutenant Peary's present expedition, or other expeditions of like nature; to receive, collect and keep on file narratives and manuscripts relative to Arctic explorations; to preserve such records and keep such accounts as may be necessary for the purposes of the association; and further, to command in its work the resources of mutual acquaintance and social intercourse.

III.—Contributors to the Peary expedition of 1898 are founders of this association.

Alfred C. Harmsworth, of the London Daily Mail, was elected honorary member, in recognition of his service to the expedition.

The club chartered the steamer Diana, Captain Samuel W. Bartlett, of St. Johns, Newfoundland, and dispatched her on July 22, 1899, from Sydney, C. B., laden with ample stores and equipment. Junction with Commander Peary and the Windward, which had wintered in Allman Bay, on the western side of Smith Sound, was effected at Etah, August 12; the Windward took her departure for the South, August 22, arriving at Brigus, N. F., September 13; the Diana, having discharged her cargo at Etah, Peary's headquarters, 1899–1900, following one week later and arriving at Sydney, C. B., September 15. The Windward brought the original scientific records and the personal effects of each officer and man of the Lady Franklin Bay Expedition; the sextant abandoned in 1876 by Lieutenant, now Rear-Admiral, Albert Beaumont, R. N., at Cape Britannia, Greenland, and copies of the Nares–Markham records from the Norman Lockyer and Washington Irving Island cairns, all recovered by Commander Peary in 1898 and 1899. The personal effects were subsequently distributed by the club to the survivors and the next of kin of the deceased, and the

relics of the Royal Navy deposited through the Lords of the Admiralty in the Royal Naval Museum at Greenwich.

The Windward, having been repaired and improved, sailed from Sydney, C. B., July 21, 1900, under Captain Samuel W. Bartlett, with Mrs. Peary and Ahnighito Peary on board, with instructions to proceed to Etah, and failing to find there Commander Peary, to cross Smith Sound to Cape Sabine, and push northward as far as might be necessary to open communication with him. The club chartered in 1901 the steamer Erik, Captain John W. Blakeney, and dispatched her from Sydney, C. B., on July 18, with instructions to proceed to Etah, where, on August 5, junction was effected with Commander Peary and the Windward, which had been ice-bound in Payer Harbor during the entire winter. The Erik and Windward spent August in the north waters, the former arriving at Sydney September 15, and the latter at Brigus, N. F., September 24. The Erik brought Commander Peary's report of his delineation of the northern end of Greenland in 1900, and Lockwood's original record from his cairn of 1882, at his farthest.

The club installed new boilers and engines in the Windward at Newburgh, N.Y., in 1902, and on July 20 of that year she sailed a third time for the North, effecting junction with Commander Peary August 5 at Cape Sabine, and returning with him to Sydney, C. B., September 15. He brought also from Fort Conger the library, instruments, and all the remaining equipment of the Lady Franklin Bay Expedition.

The founders of the club were: Morris K. Jesup, Henry W. Cannon, James J. Hill, John M. Flagler, Frederick E. Hyde, E. C. Benedict, H. Hayden Sands, A. A. Raven, Henry Parish, Eben B. Thomas, James M. Constable, Herbert L. Bridgman, Henry H. Benedict and Eliphalet W. Bliss.

Full contributing members, Edward G. Wyckoff and Clarence W. Wyckoff, of Ithaca, N. Y., and Grant B. Schley, of New York, were in 1898 elected to membership in the club, and President Charles P. Daly, of the American Geographical Society, to its executive committee, in recognition of the contribution by the Society.

GEOGRAPHICAL RECORD.

AMERICA.

CHANNELS FORMED ALONG ICE MARGIN IN CENTRAL NEW YORK.—In the 20th Annual Report of the New York State Geologist, Fairchild described some channels which he attributed to the work of streams flowing along the margin of the great ice-sheet when it was melting away from the northern central part of New York. By later work he has gathered facts leading him to the conclusion that there are other and lower channels farther north, between Syracuse and Rome. His results are presented in a brief article (21st Report N. Y. State Geologist, 1901, pp. 233–247), illustrated by four maps and 21 full-page half tones. These channel-ways, in some of which only one bank is preserved (the other having been

ice), while in others there are two banks, extend from Syracuse to Rome approximately along the line of the New York Central Railway and Erie Canal, both of which, in fact, sometimes follow the grade of the old glacial stream beds.

One of these marginal rivers is believed to have formed the valley which enters the City of Syracuse from the west, past Burnet Park, and leaves the city on the east along the line followed by the canal and the railways, being traceable as far as East Syracuse. "The business section of Syracuse and all the south part of the city occupy the detrital plain or delta which accumulated in the Onondaga embayment by the great river which cut the Burnet Park channel, and partly through more recent work of the Onondaga Creek."

These preliminary notes are of distinct interest, but glacial geologists await with especial interest the publication of the final paper, with full discussion of the phenomena, which Fairchild promises. R. S. T.

Detailed Pleistocene Mapping in New England.—In mapping the Pleistocene geology of the Housatonic Folio in western Massachusetts, Mr. F. B. Taylor has experienced no little difficulty in accounting for the phenomena which he has met in the field. His paper on The Correlation and Reconstruction of Recessional Ice Borders in Berkshire County, Massachusetts (Journal of Geology, Vol. XI, No. 4, 1903, pp. 323–364), published in advance of the appearance of the folio, is his forewarning of the introduction into Pleistocene work of an element hitherto unused—interpolation.

The region comprises the southern two-thirds of Berkshire County and includes portions of Connecticut and New York. The rocks are crystalline, there has been little glacial erosion, and an exceedingly rugged topography has greatly complicated ice movement. A main north-south valley with a north-flowing and a south-flowing stream, a broad lateral valley at right angles to it, two main mountain masses, rising well above 2,000 feet, and deep valleys trenching the main plateau characterize the region.

Taylor finds that the eastern limb of the Hudson valley lobe of the continental glacier covered this region with thick ice, which retreated across it from southeast to northwest, building recessional moraines, fifteen in number, about every 3½ miles. The valleys contain the best moraines, in the form of terminal deposits; but he also finds lateral moraines, stoss moraines, marginal drainage

channels, kames, eskers, moraine-headed gravel trains, and deltas associated with marginal lakes. Between these deposits there are, however, extensive areas of hillside and hilltop on which no evidence of terminal deposits was found. The purpose of his paper is to state his method of restoring the position of the ice margin in these intervals.

That interpolation will be necessary in detailed Pleistocene mapping is certain, and to Taylor belongs the credit of making the first attempt. The value of one's results in this direction will, of course, depend upon the correctness of the principles upon which the interpolation is based. Among the important basal principles which Taylor proposes for this region are the following: The main ice retreat was from southeast to northwest; the ice tongues of the various valleys moved synchronously, therefore admitting of no overlapping of morainic deposits; the slope along the margin of the ice tongues was uniformly about 100 feet per mile.

From merely reading the summary statements of the paper the reviewer is not fully convinced of the unquestionableness of some of these premises, on which the proposed reconstruction stands or falls; for instance, the matter of contemporaneous movements for all valley tongues and its vitally important elimination of possible overlappings. The question arises also as to whether there was such a uniform rate of slope as is assumed; whether, for example, full allowance is made for the effect of difference in width of valley, slope of valley floor, direction of the valley relatively to the main ice movement, and nearness to actively-moving ice. That there was not local glaciation of the Greylock mass—rising 3,500 feet—and of Mt. Everett, which is 2,600 feet in elevation, influencing ice-tongue movement, is a point that Mr. Taylor may have determined, but which, if not eliminated, must surely be considered. These questions are raised in no spirit of captious criticism, but with full recognition of the difficulties which confronted the author and sympathy with his efforts to establish a working basis for successful interpolation.

Interpolation will be used only as a last resort, and doubtless Taylor has exhausted all the possibilities of actually tracing ice-front deposits from valley to valley, and has thus been forced to attempt a reconstruction from fragmentary data. That there should not be ice-front deposits on some of the hills seems remarkable. In the hilly, dissected plateau of southern central New York, ice-margin deposits are traceable over hills 1,800 feet high, though sometimes with great difficulty. The more rugged topo-

graphy and harder rock of the Berkshires may account for the absence of similar records of ice-fronts there.

R. S. T.

GLACIAL GEOLOGY IN THE UNITED STATES GEOLOGICAL SURVEY GEOLOGIC FOLIOS.—The earlier folios of the Geological Survey dealt largely with areas presenting economic problems; now the work is being extended to other regions, and ultimately the entire country will be covered. About 100 folios have so far appeared.

In some of the more recent folios the study of the glacial deposits is being made one of the special features, and maps are prepared to show their nature and distribution. Several folios that have already appeared contain such maps, and others are being prepared. Among those so far published are the Holyoke, Mass.; Danville, Ill.; Ditney, Ind.; Elkland, Tioga, Pa.; Gaines, Pa.-N.Y., New York City, and Chicago folios.

The undertaking of this work marks an important event in American glacial geology, for it inaugurates new methods in the study of the glacial deposits. While some of the main facts of glacial geology have been discovered, and many working hypotheses proposed, the time has come when, in order to make much further progress, work of intimate detail must needs be done in many areas. The preparation of these folios will provide the opportunity for such study; and with the facts thus gathered rival hypotheses may be tested and unexplained phenomena accounted for. The present condition of glacial geology indicates that this gathering of facts is now its greatest need.

R. S. T.

YOSEMITE VALLEY.—Although many have studied the Yosemite region, there is still a difference of opinion concerning the cause of the remarkable valley and the falls. One hypothesis is that the deep main valley was cut out by stream erosion before the glacial period; another that it is due to ice erosion; a third that there has been a downfaulting of the valley bottom. By either explanation the tributary valleys from which the waterfalls are supplied are supposed to have been left hanging above the bottom of the main, over-deepened valley.

Prof. Branner (Journ. Geol. XI, 1903, p. 547) accepts the river erosion theory of Turner, according to which the influence of rock and joint planes has had much to do in determining the peculiar topography of the valley. He also draws attention to an interesting phenomenon—namely, the presence of a gorge at one side of the

hanging tributary valleys and deeper than the gorge through which the waters now pass. This is true not only in the Yosemite Fall but also in the Illilouette and Nevada Falls. Branner accounts for this by the erosive action of a glacial stream flowing along the ice margin when the side valleys were filled with valley glaciers. When the ice tongues disappeared these short gorges were abandoned because, although they formed notches in the valley edge, they did not lead back to the axes of the side valleys. Seen from below one wonders why the water of the falls does not emerge from these lower notches; but from above it is seen that there is no connection between the notches and the valley axes.

R. S. T.

Expedition to the Bahama Islands. — The Geographical Society of Baltimore, which was organized in October, 1902, fitted out a two-masted sailing vessel last spring for scientific work in the region of the Bahama Islands. The expedition, which was directed by Dr. George B. Shattuck of Johns Hopkins University, left Baltimore on June 1, 1903. The scientific staff numbered 22, the chiefs being Dr. Shattuck of the geological staff; Dr. W. C. Coker of the University of North Carolina, botany; Mr. Barton A. Bean, curator of fishes in the United States National Museum, marine zoology; Mr. J. H. Riley, curator in the National Museum, land zoology; Dr. Oliver L. Fassig, United States Weather Bureau, climatology and physics; and Mr. C. N. Mooney, Department of Agriculture, soil survey.

A report of the work of the expedition, written by Dr. Shattuck, appeared in *Science* (No. 457, pp. 427–32). The survey ascertained that the matter composing the Bahama Islands is not entirely made up of wind-blown coral and lime sand, but that the lower part of many islands, extending from 10 to 25 feet above the present mean tide, was deposited by the ocean, and contains marine organisms in large numbers. On this lies the deposit of wind-blown material. Both elevations and depressions have occurred; a beach mark and tide gauge were set up at Nassau to settle the question whether either process is now going on.

In the botanical department about 500 plants were collected for future study, including the lower forms of plant life, such as seaweed, fresh and salt water algæ, fungi, and lichens. The principal work was the study of plants in relation to environment.

About 1,000 specimens of marine life, 260 skins of representative birds, 100 of reptiles, and 300 of mammals were collected for

the National Museum, and interesting results were accomplished in other departments. The medical survey showed the prevalence of leprosy, the better physical types presented by the pure blacks or whites in contrast with those of mixed blood, and the better health in islands depending for food chiefly upon farm products, as compared with those in which marine food is the chief reliance.

HOVEY ON WEST INDIAN VOLCANOES.—The dramatic events associated with the eruption of Mont Pelé and La Soufrière, a year and a half ago, together with the accessibilty of the region, have led to such a thorough study of the eruptions and their effects that these volcanoes promise to serve as standard examples of volcanic eruptions, possibly replacing in part the time-honoured Vesuvius. One of the most active workers in this field has been Dr. E. O. Hovey, who has given to us not only many new facts of his own observation but summaries of the results obtained by other workers.

Just when the interest of people was beginning to flag, because of the over-supply of articles on these volcanoes, Pelé caused a revival of interest by the development of a new feature in the form of a spine or tooth which at one time reached a height of more than 1,000 feet. This spine, which rose from one side of the crater, has suffered many changes since it first appeared, and in a recent article (Amer. Journ. Sci., XVI, Oct., 1903, pp. 269–281) Hovey describes these changes, also presenting a number of excellent illustrations. He explains the phenomenon as follows:

> The spine or tooth consists of solid rock, which seems to have been pushed up bodily into its present position, and to be maintained there, somewhat like the stopper in a bottle, by friction against the sides of the neck and by the expansive forces underneath. The shape of the spine, with its sides forming angles of 75°, 87°, and even 90° with the horizontal, is a strong argument against the theory that it has been formed by ejected blocks or bombs which were sufficiently pasty to stick together on falling, and in favour of the "stopper theory." Furthermore, the northeast side of the spine presents a fairly smooth, vertically-grooved surface, as if it had been slicken-sided by friction against the side of the conduit during its ascent (see figs. 5, 6, and 7, Pl. XII, XIII). The great and sudden changes in the altitude of the spine with reference to the rest of the cone point in the same direction.

In a short article in *Science* (Vol. XVIII, Nov. 13, 1903, pp. 633–634) Hovey extends the history of the spine from May to October. In this, after describing numerous variations in the spine, he states that this phenomenon, which "was such a wonderful part of the mountain from November, 1902, to June, 1903, had practically disappeared early in August," 1903.

The same author has published in the American Museum Journal (Vol. III, 1903, pp. 41–54) a preliminary note on his observations during a recent visit to the volcanic islands of the Antillian chain. In this he briefly describes the condition of the volcanoes and presents some interesting photographs. The cone of Pelé has increased in height from 4,428 to 5,150 feet, and the valley of the Rivière Blanche has been decidedly filled with ash. Denudation has also been vigorously at work on the loose ash both in Martinique and St. Vincent. Hovey states, for example, that in a few months not less than 150,000,000 cubic feet of material have been removed from the gorge of the Wallibou in St. Vincent. The publication of his final report will be awaited with interest.

R. S. T.

Secondary Phenomena of the West Indian Volcanic Eruptions in 1902.—Mr. George C. Curtis describes (Journal of Geology, Vol. XI, 1903) some interesting phenomena connected with the eruptions in Martinique and St. Vincent. The mud-flows, which are an important phenomenon in connection with these eruptions, he believes to have been caused by the discharge of the waters of crater lakes over the mountain sides. The hot volcanic ash in the stream beds gave rise to phenomena of secondary eruptions, which he calls geyser-like eruptions, in which steam rose in some cases to a height of over 3,000 feet. It was such eruptions that gave rise to the early theory that St. Pierre was destroyed from a secondary crater in the valley on the mountain side. These secondary eruptions are due to the influx of water to the hot ash beds, which transformed it to steam, causing explosions; and Curtis suggests several reasons why there may be sufficient concentration of steam to cause such explosions. The geyser-like eruptions formed ash cones with craters closely resembling those of volcanoes, and the material of which they are made is in some cases fragments, the size of a man's head. In valleys down which the mud-flows passed, the surface often has a hummocky topography, resembling in form that of sand dunes, to which Curtis gives the name ash cone topography. This he believes to have been caused by numerous explosions, varying in violence, and more or less modified by shifting of vents, migration of stream channels, and other causes.

R. S. T.

Harbour Works at Rio de Janeiro.—The Brazilian Government has signed a contract with a British firm to make improvements in the harbour of Rio to be completed in 1910. Though

the bay is 68 square miles larger than the lower and upper bays of New York together, the water near the shores is shallow, the bottom is silting up, and no large vessels are able to tie up along shore. A sea wall or quay, two miles in length, is to be built along the entire northern front of the city. The quay will be wide enough for railroad trains and wagons to move along it. Outside of the quay a channel will be dredged to a width of 820 feet and a depth of from 26 to 33 feet, so that the largest shipping can be accommodated. Vessels will tie up along the front of the sea wall and cars and wagons will carry freight to or from them.

CLIMATE OF THE ARGENTINE REPUBLIC, Compiled from Observations made to the End of the Year 1900. By Walter G. Davis, Director of the Argentine Meteorological Office. Fol. Buenos Aires, 1902, pp. 154. Pls. XXVI. Text in Spanish and English.

In the Second Census of the Argentine Republic (May 10, 1895), published in 1898, there was a chapter on Climate, written by Mr. Walter G. Davis, Director of the Argentine Meteorological Office. This chapter was in Spanish. It has now been reprinted, in Spanish and English, with the addition of newer data to the end of 1900, and of a larger number of stations. Altogether, the volume is one of the best publications on the climate of one country which we have seen, and bears witness to the excellent work which Mr. Davis is doing in his adopted land. The Argentine Meteorological Service now stands with most of the services of the North Temperate Zone, and is a splendid monument to the skill, the energy, and the scientific ability of its directors.

The treatment of all the climatic elements is thoroughly scientific and complete. In fact, the volume might well serve as a model for future investigations of this sort. The Republic may be divided into three general climatic provinces, on the basis of the temperature and rainfall, the Littoral, the Mediterranean and the Andine, the axes of greatest elongation being north and south, and each of these three main divisions being subdivisible into northern, central, and southern sections, whose differences depend chiefly on latitude and altitude. With the great extent of the Argentine, embracing as it does 33° of latitude, the differences between north and south are necessarily very great; but there are also extraordinary changes in temperature and rainfall in going from east to west across country, narrow as it is. Thus, taking the zone of a degree and a half of latitude which lies north of the Tropic of Capricorn,

we find, on the eastern frontier, a mean annual temperature of 73.4°. Crossing the isotherms at right angles, a temperature of less than 57.2° is found at the western limits. As to rainfall, in this same distance of about 500 miles "the aspect of the country changes from the lowlands of the Chaco, covered with a tropical vegetation, to the arid table-lands of Salta and Jujuy, which in turn merge into the Cordilleras, with their highest peaks under the mantle of perpetual snow."

The famous Argentine "zonda" is described as being so dry that people sprinkle their floors and walls to cool the air while it blows. A section is devoted to the temperature of evaporation, which has been called "sensible temperature," and we have never seen a publication which contained tables and charts of sensible temperatures, by months, for a number of stations. Perhaps the most striking feature on any of the charts in the volume is the rapid decrease of pressure south of the 45th parallel, shown on the isobaric maps, the successive isobars running across the country, almost due east and west, close together. This is the natural consequence of the southward extension of South America into the region of permanent low pressure in the Antarctic. The highest relative humidity is found in the north and in the extreme south. In the Andine provinces it frequently happens that the relative humidity does not exceed 2 or 3%. In fact, according to the ordinary psychrometer tables, some observations in this district give a relative humidity of 0%. As this is impossible, it is clear that the reduction formulæ are not applicable to such cases of extreme dryness.

In places near the foothills and eastern slopes in the Andine region rain is almost unknown, while in the extreme northeast the isohyetal line indicates a rainfall of over 80 inches.

Nothing but praise can be given to this admirable volume, which is so complete, so well written, and so abundantly illustrated. Now that attention is being turned more and more to South America, it is well to have such a report at hand for reference. Would that we had something of the sort for the United States!

R. DeC. W.

ASIA.

PHILIPPINE COAST SURVEY.—Mr. George R. Putnam, in charge of the Philippine coast surveys since they were started in January, 1901, informs the *National Geographic Magazine* (Dec., 1903) that during the past year the survey steamer *Pathfinder* has completed

the survey of San Bernardino Strait and Albay Gulf, of San Pedro Bay, and the southern coast of Samar, and has also made a thorough examination of the much-frequented passage southwest of Leyte, where a danger to navigation had been reported. Among the latest harbour surveys are those at Cebu, Ormoc, and Romblon. The small wooden steamer *Research* has made a number of harbour surveys on the west and southeast coasts of Luzon and on Mindanao and Culion Islands, and is now working on the coast of Negros. Chartered launches are also employed in the quieter waters of the deep indentations, and by this means a survey of Lingayen Gulf has recently been completed.

Charts embodying the results of the surveys are prepared in the office at Manila, published by lithography and distributed. Seven pamphlets of sailing directions have been issued, and "Notices to Mariners" are printed from time to time, giving new information of immediate importance, such as dangers discovered, aids to navigation, and changes in the charts.

Many parts of the coasts have as yet been only roughly sketched, while other surveys are controlled by triangulation. There are nearly 1,700 islands in the Philippines that are named, and it is possible to count 3,000 islands and islets on the charts.

Monthly Normals of Air Pressure in India.—Barometric observations in India were originally taken to aid in working out the climatology of that region, and they were not published in the form of daily weather reports. The importance of early information regarding coming weather conditions, and especially regarding rainfall, with the added emphasis which was given to this matter by the occurrence of the Bihar Famine in 1874, the Madras Famine in 1877, and the late and scanty rainfall of the southwest monsoon in 1878, over Northwestern India, led the Government of India to sanction arrangements for the publication of a daily weather report in June, 1878. At first this report included the observations recorded at 10 A. M. at about 100 stations, and a brief summary of the observations, and it was issued without an illustrative chart. The hour of observation was later changed to 8 A. M., the observations being for a time recorded at 8, 10, and 16 hours. The mean monthly pressures for the 10 and 16 hours for the years previous to 1889, and, after that, the mean 8 A. M. monthly pressures, reduced to 32° F. and to constant gravity (Lat. 45°), for all observatories in India which have been in operation at least twenty years, have now been published by Sir John Eliot, Meteorological Reporter to the

Government of India (Vol. XIV, Part II, Indian Meteorological Memoirs), the volume furnishing the most complete information in regard to the pressure conditions of India. It is a noteworthy fact that there are some persistent disagreements between the pressures at some of the stations, the four most marked cases being those of the observatories at Dehra Dun, Ajmer, Jaipur, and Salem. At each of these four stations the 8 A. M. pressures are somewhat too high. The explanation given by Sir John Eliot is that these observatories are more or less completely shut in by hills of considerable elevation, which diminish the horizontal air movement, and thus give a somewhat higher air pressure during the morning than there would be in the case of free air movement. The effect is purely topographic. In the cases of Ajmer, Salem, and Dehra Dun, which are almost completely shut in, the excess of pressure averages about .02 ins. At Jaipur, which is less completely surrounded, it is about .010 ins.

R. DE C. W.

THE GERMAN RAILROAD IN SHANTUNG.—This railroad, from the port of Tsing-tao on Kiao-chau bay across Shantung province, China, to the large city of Tsinan-fu, on the Hoang River, will be completed before June 1 next. Four-fifths of the line is now in operation. On September 1 last the road was completed to Chou-tsun, 196 miles from its starting-point. This city of about 50,000 inhabitants has a great trade, and is the emporium of the silk trade of Shantung. The city of Tsinan-fu, to which trains will be running next summer, is the capital of Shantung, and has over 300,000 inhabitants. The commercial routes centering at this great mart extend in all directions and as far away as Peking, Hankow, and Shanghai. The railroad passes through the heart of Shantung, which, according to the Chinese census, taken last year, is the most densely-peopled part of the empire.

GENERAL.

BRITISH RAINFALL ORGANIZATION.—The retirement, on August 31st last, of Mr. H. Sowerby Wallis from partial charge of the British Rainfall Organization, and the succession of Dr. Hugh Robert Mill to the sole responsibility, makes this time a suitable one for a brief historical note concerning this interesting meteorological service, which was the crowning achievement of the life of the late Mr. George J. Symons. In the year 1859, when Mr. Symons was twenty years old, he began collecting records of rainfall,

and although this did not form a part of his official work for the Meteorological Office, which he joined in 1860, he sent out, late in that year, a circular letter to all the observers of whom he knew in England, stating that he proposed to collect all the published and unpublished observations of rainfall. Mr. Symons's publication was begun in 1860, when "English Rainfall" appeared, containing the observations made at 168 stations. In the following year the publication contained data for both 1860 and 1861, and was entitled "British Rainfall," as it has remained ever since, the number of stations being 360 in England, 11 in Wales, 115 in Scotland, and 21 in Ireland—a total of 507.

In 1863, Mr. Symons left the Meteorological Office to devote himself exclusively to his chosen task, the expense of collecting and publishing being borne by himself alone at the start, but later being shared, in increasing proportion, by the observers and by Mr. Symons's own friends. In ten years the number of stations was 1,500, and the work required all of Mr. Symons's time for nearly five months of each year. The scope of the work had become national in every sense, but Mr. Symons preferred to continue it as a private enterprise, without State aid, feeling that unless this assistance were given without hampering conditions he could carry on his investigations better by himself.

In 1872, Mr. H. Sowerby Wallis became associated in the work, and continued his connection with the organization until his resignation on August 31 last.

In 1890, the number of stations included in the annual volume was 3,000, and the name of Mr. Wallis appeared with that of Mr. Symons on the title-page of "British Rainfall." In March, 1900, after the sudden death of Mr. Symons, Mr. Wallis assumed the entire charge of the work, and this responsibility, together with the vast amount of detail occasioned by the settlement of the estate and the transfer of the Symons Library to the Royal Meteorological Society, and the ill-health from which he suffered, made it necessary for him to give up his arduous labours. Dr. Hugh Robert Mill, whose name is well known to geographers, and who has been associated with Mr. Wallis for the past three years, has now succeeded him as head of the British Rainfall Organization. Dr. Mill has acquired the historic "rainfall house" of Mr. Symons at 62 Camden Square, London, N. W., and all the rainfall records and instruments there. The organization of which Dr. Mill has control is absolutely unique in its character of a national meteorological service conducted as a private enterprise, without Government aid.

This Organization has already done a most important work for British Meteorology and Climatology. That in the future, under its new head, it will continue and extend its useful labours no one who knows Dr. Mill's capacity can doubt.

R. DEC. W.

VARIATIONS OF GLACIERS.—Each year the International Committee on Glaciers, appointed by the International Geological Congress, makes a report upon the recorded variations in glaciers throughout the world. The summary of the 6th annual report, written by Dr. H. F. Reid, has appeared in the Journal of Geology (Vol. XI, 1903, 285–288). One of the most striking features of these reports is the fact that, in general, glaciers are retreating at their margins. Of ninety-four Swiss glaciers, only one, the Boveyre in the Valais, was found to be advancing in 1901. This glacier, which has advanced 108 metres in ten years, is doing so because of an avalanche which has increased its thickness and length. The greater number of the fifty-five glaciers in the eastern Alps are also retreating, though a few, especially the Vernagt, are advancing; this glacier having gained 50 metres since 1900. All glaciers observed in the Italian Alps are retreating, and retreat is noticed also in the French Alps, Scandinavian mountains, and the Caucasus. Retreat is indicated in the Alaskan glaciers, and some interesting facts concerning these glaciers are stated. Observations indicate a general retreat of glaciers in the Rocky and Sierra Nevada Mountains.

The facts thus gathered and tabulated have not been recorded long enough to admit of general conclusions; but it is evident that this work is a very important one, and that in time the records will give material of great value in considering the nature and causes of fluctuations of glaciers throughout the world. The committee or any one of its members (for example, Dr. H. F. Reid, Johns Hopkins University, Baltimore, Md.) will be very glad indeed to receive any information concerning the changes in glaciers in any part of the world.

R. S. T.

BLOOD COUNTS AT HIGH ALTITUDES.—One of the effects of the decreased pressure which is met with at increasing altitudes above sea-level is a change in the composition of the blood, both of human beings and of animals, as has been observed by several investigators. Viault, for example, examined the blood of men and of animals on the Pic du Midi and on the plateaus of Peru, at altitudes of 12,000–14,500 ft., and found a greater amount of haemo-

globin than usual. Viault's own blood contained 5,000,000 red blood corpuscles per cubic millimeter while he was at Lima, and after two weeks at Maracocha, at an altitude of 14,400 ft., the number rose to 7,000,000, and a week later to 8,000,000. The blood of Viault's companions showed similar changes, while in the case of animals taken from the lowlands to the plateau the increase was in the ratio of 4.8 to 7.0. Müntz found about the same ratio in the case of rabbits taken onto the Pic du Midi. On descending to the lowlands, this increased amount of haemoglobin in the blood is lost. Similar investigations have been made by Bert, Egli-Sinclair, Egger, and others, the general feeling being that the increased number of red corpuscles is needed to enable the blood to absorb sufficient oxygen from the rarefied air.

A recent study of blood counts at high altitudes has been made in this country by John Weinzirl, M.S., and C. E. Magnusson, Ph.D., and the results have been published in Nos. 7 and 8 of the *Bulletin of the Hadley Climatological Laboratory* of the University of New Mexico. A grant from the Elizabeth Thompson Fund aided the research. The first paper deals with "Cold as a Causal Factor in the Blood Changes due to High Altitudes," and the second with "Further Observations on Increased Blood Counts due to High Altitudes." The authors of these papers have made numbers of blood counts in the cases of human beings and of rabbits taken to high altitudes, and they conclude that cold is an important factor, though not the only one, in producing the observed changes in the blood. The increase in the number of red corpuscles they find, as others have already found, to be temporary, and this they believe is also due to the change in temperature and not to the change in pressure. R. DeC. W.

Concretions as Elements in determining Land Forms.—Among the geological phenomena that have attracted widespread attention from time long antedating the beginnings of geology as a science is the concretion.

The weird and fantastic forms which concretions at times assume early led to attempts at their explanation. Recently Todd (Bull. Geol. Soc. Amer. XIV, 1903, pp. 353–368) has discussed their origin and stated many facts concerning them, presenting also several plates of illustrations. One of the important parts of his paper is that in which he shows that concretions, where abundant, are of importance in influencing the rate of denudation, and, therefore, in determining the form of the land surface. Being more

finely cemented than the rock in which they have developed, they are more resistant to denudation. Therefore they serve to protect the rock in which they are enclosed. Certain pinnacles in Bad Land regions, and certain buttes and knobs, are thus explained as the result of the protection of one part by the presence of concretions, while denudation has removed less protected rock round about. It would be interesting to apply Todd's suggestions to a given region of abundant concretions in order to determine the measure of importance of this element of influence in land sculpture. R. S. T.

HUMAN BONES FOUND NEAR GALVESTON.

A Letter Communicated by Mr. James Douglas.

October 12th, 1903.

Dr. James Douglas, President,
El Paso & Southwestern R.R. Co.,
99 John St., New York City, N. Y.

Dear Sir:—

Complying with your request to furnish you the data relative to the human bones found in the ballast pits of the Galveston, La Porte & Houston Ry. (now part of Southern Pacific) near Galveston, Texas, I beg to say:

The ballast pits are situated at the mouth of Clear Creek about 32 miles southeast of Houston, Texas, and 25 miles from Galveston, and lie between the creek and the Bay. Originally they covered about 20 acres, and rose to an elevation of 18 or 20 feet above mean low tide. The deposit consisted of about 50% shell of various kinds, oyster, clam, etc., 40% gravel and 10% coarse sand. The whole deposit was covered with about eight inches of soil, and had a dense growth of live-oak trees, some of which seemed very old. The deposit was in seven distinct strata, averaging about 2½ ft. in thickness, with about two inches of black earth between.

All the strata were very much the same, except the bottom one and the second one from the top. These two had very little gravel in them, and consisted of oyster shells (larger than in the other strata) and black earth, and it was in these two "veins" that we found the human bones, one "layer" of bones a little over three feet below the surface, and the other at sea level about twenty feet below surface.

We found very few bones in the upper stratum—probably ten per cent. of the whole—the greater majority being at about the present sea level.

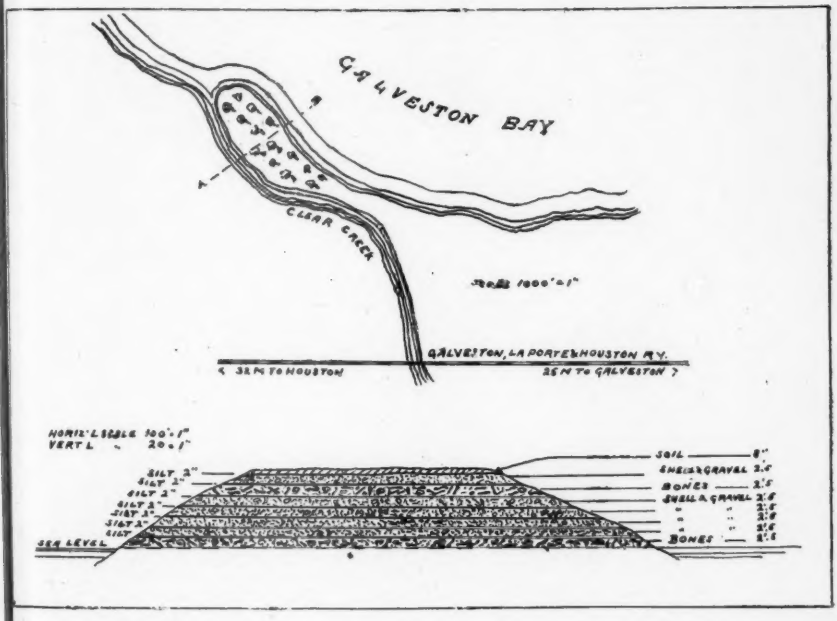
No accurate count of the total number found was kept, but over fifteen hundred were actually tallied, and a conservative estimate would be five thousand.

At first the gravel was loaded by hand, and during this period the foreman counted the skulls, but, later on, a steam shovel was put to work, and after that no count was attempted, though the bones were uncovered daily until the entire pit was worked out.

We usually found two or more skeletons together, and, in one instance, found fourteen, all practically touching.

They were, of course, in no regular order, but were in every conceivable position. When first exposed the bones were wet and soft, but after drying in the sun would be fairly hard and firm. After the steam shovel was put to work, practically all bones were broken when they got to the surface. Some of the skulls were of enormous size, and all had very low foreheads. All seemed to be adults, and one noticeable feature was the almost perfect condition of the teeth, which showed absolutely no sign of decay.

Several broken pieces of pottery were found, also some presumably ivory beads,



about 1⅛ inches long, with a hole lengthwise through the centre and a diagonal groove on the outside.

Some of these bones were sent to the Pan-American Exposition at Buffalo some years ago.

The last of this shell deposit was removed during the Summer of 1896.

I attach a small sketch, made from memory, showing approximately the location of the ground and the arrangement of the strata.

Yours respectfully,

(Signed) H. J. SIMMONS,
General Superintendent.

NEW MAPS.

AMERICA.

UNITED STATES.—Map of the State of New York. Scale, 12 statute miles to an inch. Frederick J. H. Merrill, State Geologist, State Museum *Annual Report*, 1901, Albany, 1903.

This excellent map shows the surface features and watersheds of New York State. Brown tints are used to emphasize the contours, which are drawn on the coast at intervals of 50 and in the interior at intervals of 200 feet. Green lines form the boundaries of the several drainage basins. The map represents admirably the broader generalizations as to the topography and drainage of the State. The elevation of nearly all the lake surfaces is given.

UNITED STATES.—State of North Dakota. Scale, 1:760,320, or 12 statute miles to an inch. Compiled under the direction of Frank Bond, General Land Office, Washington, D. C., 1903.

CANADA.—Alberta and Western Portions of Saskatchewan and Assiniboia. Scale, 1:792,000, or twelve and one-half statute miles to an inch. James White, Geographer, Department of the Interior, Ottawa, 1903.

A land office map showing the location of the land offices, names and outlines of the land districts and the extent of the land surveys, which have been so far completed in Alberta as well as in Assiniboia that claims may be taken up in most parts of those provinces.

CANADA.—Topographic map of the Rocky Mountains. Banff and Lake Louise sheets. Scale, 1:127,000, or two statute miles to an inch. Department of the Interior, Ottawa, 1902.

These maps, with a contour interval of 250 feet, include the Rocky Mountains Park of Canada and areas to the west around Lake Louise, Kicking Horse Pass and Mt. Stephen, showing the route of the Canadian Pacific railroad from its entrance into the mountains as far west as Palliser.

CANADA.—Map of the Yukon District, with the adjacent northern part of British Columbia. Scale, 1:750,000, or 11.84 statute miles to an inch. Department of the Interior, Ottawa, 1903.

The map shows the railroad from Skagway, which was completed in 1900 to Whitehouse, about twenty miles south of Lake Laberge; the distance of the terminus from Skagway is about 90 miles in a straight line. At Whitehouse passengers and freight cars are transferred to a stern wheel steamer plying to Dawson. A Klondike railroad extends about twelve miles between Dawson and Grand Forks at the junction of Sulphur and Eldorado Creeks. The heights of many elevations are given.

PATAGONIA.—Fondeadero Atlas. Bahia Vera. Scale 1:20,000, or 0.3 statute miles to an inch. Hydrographic Office, Buenos Aires, 1901.

This sheet is one of the first charts published by the Hydrographic Office of the Argentine Government, organized not long ago. This office is surveying anchorage and landing-places along the east coast of Patagonia at points favourable for colonization. The area chartered on this sheet is south of the Chubut River. Many soundings are given and details of the coast are clearly drawn.

EUROPE.

AUSTRIA-HUNGARY. Autriche-Hongrie. Les Races. Scale, about 138 statute miles to an inch. By René Henry. *Revue de Géographie*, Paris, October, 1903.

The map shows in five colours the distribution of Slavs, Germans, Rumanians, and Italians in the Austria-Hungarian empire and illustrates a paper by Mr. Henry.

GERMANY. Die landwirtschaftlichen Hauptbetriebe in Preussen, 1895. Scale, 1:2,750,000, or 43.5 statute miles to an inch. *Zeitschrift* of the Royal Prussian Statistical Bureau. Berlin, 1903.

The map gives a minute idea of the differing degrees of intensity of agriculture throughout Prussia.

GERMANY. Übersichtskarte über das Nordschleswigsche Wattenmeer und die Bodenverhältnisse des Landgebietes. Scale, 1:300,000, or 4.73 statute miles to an inch. By E. Moritz. *Mitteilungen der Geographischen Gesellschaft in Hamburg.* Vol. XIX. Hamburg, 1903.

The map shows the sand banks and mud flats which are exposed at low water along the coast of north Schleswig; and the geology of the neighbouring coasts and islands.

ASIA.

INDO-CHINA. Projets d'Irrigation dans le Delta du Fleuve Rouge. Scale, 2:500,000, or 7.8 statute miles to an inch. *Annales de Géographie*, No. 66. Librairie Armand Colin, Paris, 1903,

Showing the drainage and irrigation works completed, in progress, or projected in the delta of the Red River.

INDO-CHINA. Réseau des grandes voies navigables de la Cochinchine et du Cambodge. Scale, 1:1,000,000, or 15.7 statute miles to an inch. *Annales de Géographie*, No. 66, Librairie Armand Colin, Paris, 1903.

The navigable waterways and the extent to which they are utilized by various lines of vessels are indicated; also the canals which are to connect the various waterways.

TIBET. Professor Dr. Karl Futterers Routen-Aufnahme vom Küke-nur durch nordost-Tibet bis Min-Tschôu, sheets I and II. Scale, 1:500,000, or 7.8 statute miles to an inch. By Dr. Hassenstein and C. Schmidt. Gotha, Justus Perthes, 1903.

The map illustrates Dr. Futterer's "Geographische Skizze von nordost Tibet," published by J. Perthes as *Ergänzungsheft* No. 143 to *Petermanns Mitteilungen*. The journey occupied from Aug. 11 to Nov. 29, 1898. All important detail which could be observed from the line of travel is indicated. Photographic surveys were helpful in drawing the map.

AFRICA.

CONGO INDEPENDENT STATE. Carte du Katanga. Scale, 1:1,000,000, or 15.78 statute miles to an inch. By H. Droogmans, Financial Secretary-General of the Congo Independent State. Brussels, 1903.

Katanga is the southeastern part of the Congo State. This vast region is administered by the Special Committee of Katanga, whose agents have been exceedingly active in its exploration, with the result that parts of the country have been proved to be highly mineralized or rich in rubber. This black-and-white map is a collection of

material supplied by these explorers, including Capt. Charles Lemaire, who astronomically determined the position of many points in Katanga, especially in the south and along the west shore of Lake Tanganyika. The map is largely based upon these determinations. The comparatively large scale makes it possible to insert many itineraries and place-names, to indicate hill features and very many waterways.

UGANDA PROTECTORATE.—Three maps. Scale, 1:2,220,750, or 32 statute miles to an inch. Reports of the Sleeping Sickness Commission No. II. Harrison & Sons, 1903.

The first of these maps illustrates, in shades of brown, the distribution of sleeping sickness around the northern part of Victoria Nyanza up to Oct. 23, 1902; the second, the distribution of *Filaria Perstans*, an animal parasite, in Uganda; and the third, the distribution of banana culture and clothed people in Uganda. Nos. III and IV of the Reports contain later maps showing the revised distribution of the disease in Uganda; and No. IV a map showing the distribution of *Glossina Palpalis* in Uganda. The distribution of Sleeping Sickness and *Glossina Palpalis* correspond. It has been ascertained that the disease is caused by the entrance into the blood and cerebro-spinal fluid of a species of trypanosoma; that the trypanosomes are transmitted from the sick to the healthy only by the *Glossina Palpalis*, a species of tsetse fly; in other words, sleeping sickness is a human tsetse fly disease.

MADAGASCAR.—Völkerkarte von Madagaskar. Scale, 1:12,000,000, or 189.3 statute miles to an inch. *Deutsche Rundschau für Geographie und Statistik*. Vol. XXVI, No. 2, November, 1903. A. Hartleben, Vienna.

Showing in colours the distribution of the various peoples of Madagascar, with the subdivisions of the Sakalava. The inland areas that are very thinly populated are left uncoloured.

OCEANIA.

AUSTRALIA.—Approximate route of the proposed Transcontinental Railway from Oodnatta to Pine Creek. Scale, 1:6,336,000, or 100 statute miles to an inch. Surveyor General's Office, Adelaide, South Australia, 1902.

This sketch map appears in the pamphlet on the proposed "Land-Grant Railway across Central Australia" from Adelaide to Port Darwin, issued by the Government of South Australia in 1902. The figures of average rainfall for a series of years, laid down at eleven points through the so-called desert of inner Australia, show a larger precipitation than this region has usually been credited with; and many areas of grass are indicated.

QUEENSLAND.—Geological Sketch Map of Queensland. Scale, 1:2,534,400, or 40 statute miles to an inch. By B. Dunstan and H. W. Fox. Geological Survey of Queensland. Brisbane, 1902.

In addition to the geological formations shown in colours the map indicates the position of the gold, coal, opal, and other mineral fields in the state.

POLAR.

NOVAYA ZEMLIA.—Borissows Aufnahmen in Nowaja Semlja im Winter, 1901–2. Scale, 1:300,000, or 4.7 statute miles to an inch. *Petermanns Mitteilungen*, Vol. 49, No. 10, 1903. Gotha.

Three maps on one sheet showing the results of surveys by the Russian artist Borissov, of three deep, narrow bays or fiords (Tsekin, Rasmyslov, and Medweshji Bays), on the east coast of Novaya Zemlia, of which only Tsekin Bay has hitherto been indicated on the maps.

THE WORLD.

WORLD.—Das Kabelnetz der Erde. Mercator Projection. Equatorial scale, 1:85,000,000. *Deutsche Rundschau für Geographie und Statistik.* Vol. XXVI, No. 1, October, 1903. A. Hartleben, Vienna.

An excellent map, distinguishing in colours the British, American, French, Danish, German, and other cable lines, and also showing the projected lines and the chief lines of land telegraph.

WORLD.—Die abflusslosen Gebiete der Erde. Hemispheres. Vertical-Horizontal Projection. *Deutsche Rundschau für Geographie und Statistik.* Vol. 26, No. 3 Vienna, 1903.

Showing the areas of interior drainage and illustrating an article on this subject by Mr. W. Henz.

ATLASES.

DENMARK.—Lomme-Atlas over Denmark. 7¼ by 4¼ inches. Copenhagen, Vilhelm Prior. 1902.

A pocket atlas containing twenty coloured maps, of which sixteen are given to Denmark and four to the colonies. The scale of the Denmark sheets is uniformly 1:420,000, or 6.6 statute miles to an inch, which is large enough to include practically all the place-names and show in addition the distribution of sand, marsh, timber, hill features and other aspects of the country. The map of Greenland is not extended far enough up the east coast to show Angmagsalik, the chief settlement on that coast.

ATLAS UNIVERSEL DE GEOGRAPHIE.—Ouvrage commencé par M. Vivien de Saint-Martin et continué par Fr. Schrader. No. 16-Péninsule Ibérique; scale, 1:2,500,000, or 39.4 statute miles to an inch. No. 49-Asie en 10 feuilles (feuille IV, Japon, Corée, Mandjourie); scale, 1:5,000,000, or 78.9 statute miles to an inch. No. 64-Afrique Française en 3 feuilles (feuille I, Afrique Occidentale Française); scale 1:5,000,000, or 78.9 statute miles to an inch. Librairie Hachette et Cie, Paris, 1903.

The sheet Japan, Corea, Manchuria (zenithal-equidistant projection) is on a larger scale than most atlas sheets of this region, and is engraved in the superior style characteristic of this atlas. What is known of the topography is sharply and clearly defined. On the sheet French West Africa, the numerous surveys of the French Military Geographic Service and of other explorers for the past ten years have been utilized, and the resulting product on the whole is the best atlas map of this region that has yet appeared.

M. FROIDEVAUX'S PARIS LETTER.

PARIS, NOV. 19, 1903.

The organization of the *voirie vicinale*, charged with the supervision of the district roads, dates from the year 1836, when the map of France, known as the map of the General Staff, was already well under way. With the needs created by the establishment of the great railways, the network of the communal roads extended until it covered the whole country with a system which is still in process of development.

The local administrations undertook, at an early day, to construct road-maps for immediate use, but without concerted action or reference to any general plan. It was evident to those who inspected the collection of these maps on exhibition at the Ministry of the Interior in 1878 that there was but one remedy for this state of things—to construct a map of the whole of France, according to a single plan, and on one scale.

The Ministry of the Interior determined to undertake this work and to bring out a map which should constitute a sort of dictionary of the highways and the paths of the country. A plan, devised by a Special Commission, received the approval of the Parliament, and the Ministry entered upon its task. The first sheets of this map appeared in 1879, and in 1896 the work was completed with the publication of the 587th sheet.

Of explorations there is something to report. In Africa, M. E. F. Gautier has visited a portion of the Muydir plateau and the whole of the Adrar Ahnet, and has pushed on to In-Zize, almost midway to Timbuktu; a point previously reached by none but Laing, about eighty years ago.

At In-Zize, M. Gautier discovered a number of inscriptions in Targui characters*, and some rock drawings (evidently later than the Seventh Century, since they include the camel), and offering in their careful style a contrast with the summary drawings of the same epoch from southern Oran. The region is extremely arid and uninhabitable.

Very different is the country of Portuguese Guinea travelled by the Franco-Portuguese Boundary Commission, which has traced the course of the Rio Grande and the Componi, and assigned to

* The alphabet of the Tuareg.

France the territory of Kadé. There remains to be settled the southern frontier of Cazamance, and when this is done it will be possible to issue exact maps of a West African district still very little known.

A similar work of delimitation has been performed by the Anglo-French Commission on the frontier of the Ivory and the Gold Coasts, from Nugua (on the Tanoe) to Bonduku, and from Bonduku to Tampuri (11° north latitude). The map, on a scale of 1:250,000, is based on 2 determinations of longitude and 49 of latitude.

To the north of this region, Lieut. de Franco, in five years' exploration in the bend of the Niger, has accumulated a series of itineraries of the greatest value. His work outside of the bend of the Niger has already been utilized in Lieut. Chédeville's map of the Third Military Territory.

A letter from Capt. Lenfant, published in *La Géographie*, shows that at the end of August he cherished the hope of finding a waterway to Logone, notwithstanding the contradictory statements gathered on his march.

In the West, Lieut. Faure is exploring the Tuburi depression, in order to furnish information to Capt. Lenfant for this portion of his journey. In Eastern Africa, M. Charles Alluaud has made a zoological exploration from Mombasa to the shores of the Victoria Nyanza, and M. d'Ollone is on his way to Harrar.

In Asia, M. Martel is actively at work in the Caucasus. Capt. Cros, of the French Chaldean Expedition, has surveyed with the Peigné compass, and, barometrically, a complete itinerary from Damascus to Bagdad, joining the line of the railroad at Filudja, on the Euphrates. His map is on a scale of 1:100,000.

A letter from Lieut. Grillières, published in *La Géographie* for September, announces his success in tracing the Pu-tu-Ho, the Blue River, and the Niu-Lan-Kiang, which he ascended to its source, opposite Yang-Ling, across a country of which the very roughest districts of the Alps barely give an idea. He laid down his route on a scale of 1:50,000. His plan was to reach the frontier of Tibet and enter that land by the valley of the Salwen.

M. Gervais-Courtellemont, who lately returned from a journey of eighteen months in Yunnan and Tibet, reports having explored and mapped the bend of the Yang-tse. He has not yet published the account of his journey, but he has exhibited at the Galérie d'Orleans a display of the principal productions of the region and the kinds of merchandise for which it offers a market.

M. Bordat writes that in New Caledonia an exploring expedition

is about to start for the island of Espiritu Santo, in the New Hebrides.

In South America, M. Eugène Robuchon has left Iquitos, to ascend the River Putumayo as far as possible, and then to cross by land to the Napo and return to Iquitos—a journey which should furnish interesting comparisons with that of the regretted Dr. Crevaux in 1879.*

Dr. Neveu Lemaire, of the Scientific Mission to Peru and Bolivia, made in June a study of Lake Poopo (Aullagas).

In company with Prof. Julien Thoulet, Dr. J. Richard, and other men of science, the Prince of Monaco, during his last oceanographic excursion, made a study of the deep-sea circulation at a distance from the French coasts. He took soundings to the depth of 4,835 metres (15,863 feet) and made fine collections, geological and planktonic, though unfavourable weather defeated his proposed investigation of the migrations of the sardine. One of his collaborators, Lieut. Sauerwein, has employed in hydrographic operations the *tachéographe* of M. Frantz Schrader, which traces automatically horizontal distances and differences of level. With the help of this instrument M. Sauerwein has executed a plan of the Mediterranean coasts around Monaco, and as far as the Italian frontier, gathering systematically samples of the bottom, and laying down on his map from the study of these the geology of the sea-bed.

Some of the publications, mentioned only by title in preceding letters, may now be considered at greater length to advantage.

Geographers devote themselves, perhaps too exclusively, to the study of the surface of the soil, with but rare allusions to the succession of materials in depth, and to the tectonic arrangement; as if they studied the façade to the neglect of the architecture. This method is declared by Commandant Barré, in the introduction to the *Architecture du Sol de la France*, to be no longer admissible. His previous studies (on the Region of the North-East, on the Forest of Fontainebleau, on the Upper Valley of the Saône) had prepared him for the composition of this instructive volume. Here are brought together, arranged on a general plan and harmonized with each other, the different elements which geology supplies to geographers for the description of France. Every page of the book

* The atlas of *Fleuves de l'Amérique du Sud*, published in 1883 by the Société de Géographie, contains 12 plates which show the course of the Içа (Putumayo); constructed on the scale of 1:200,000 by M. J. Hansen from the MS. surveys of Dr. Crevaux.

shows how the structure of the soil makes the law for the movement of the waters, as well for the fainter slopes as for the most abrupt elevations, and regulates the disposition of the rock masses, forcing the sculpture of the soil to take account of the oldest forms, as well as the latest. Besides numerous sketches and geological sections, the work is illustrated by outline perspectives, which distinguish very clearly the different compartments of the soil. No doubt, we must regard Commandant Barré's volume as an essay to be modified in many respects hereafter, but none the less it enforces the lesson that the map must be read not only as a plan, but also as representing depth, and even duration of time.

Naturally allied to this work is the *Tableau de la Géographie de la France*, written by M. P. Vidal de la Blache, as an Introduction to the great History of France from the Earliest Times to the Revolution, edited by M. E. Lavisse.

M. de la Blache has taken especial pains to bring out the relation between the soil in its present aspect and its composition and geological history. We must not fear, he says, that we shall in this way disturb the impression created by the lines of the landscape, the forms of relief, the contour of the horizon, and the outward aspect of things. On the contrary, the comprehension of the causes enables us to appreciate more justly the resulting harmonious arrangement. In the first part of his admirable work M. de la Blache has shown how a portion of the earth which is neither peninsula nor island, nor properly to be regarded as a whole in physical geography, has developed into a political country and become at last a fatherland. In the second part, *Regional Description*, the physiognomy of France is presented under all its various aspects. The text is illustrated by various excellent maps.

Works such as those of MM. Barré and de la Blache are not to be produced until a country is in possession of exact and detailed topographical maps like the maps of France on the scale of 1:80,000, recently described in these pages. Col. Berthaut, head of the Cartographical Section in the *Service Géographique de l'Armée*, has lately published a book on the Military Geographical Engineers, the precursors of the officers to whom is due the execution of the map known as that of the General Staff, and fully described in all its details in an earlier work by the same author.

The volume just issued relates the history of the tasks accomplished by the military geographical engineers in countries outside of France.

It may, perhaps, be said that Col. Berthaut has passed too

lightly over the work done in the 18th Century beyond the boundaries of Europe; but his book tells a great part of the history of French geography for two centuries (from 1624 to 1831).

It contains reproductions in facsimile of numerous manuscripts and engraved maps, French and foreign, which constitute a veritable album of the changes effected in the methods of representing surface and relief in cartography.

The last work to be noticed is rather anthropological and ethnographic than geographical, though its value to students of geography is beyond question. This is Dr. Verneau's book on the Ancient Patagonians, a contribution, as he calls it, to the study of the Pre-Columbian races of South America. From the study of the collections brought by Dr. Machon from the Rio Negro and the Chubut, of those in the *Muséum d'Histoire Naturelle* and the Anthropological Society and those gathered in Patagonia by Comte Henry de la Vaulx, Dr. Verneau has satisfied himself that the most southern portion of the American continent was peopled in ancient times by many and various groups: *platy-dolichocephalic*, *hypsi-dolichocephalic*, *platy-brachycephalic*, *sus-brachycephalic*, besides the Araucanian type and another, also of small stature but extremely robust, and three others which deformed the skull in fashions differing from the practices in vogue among the Tehuelches and the platy-brachycephalic types. The peopling of the southern parts of America was effected by migration. The two ethnic groups, numerically the most important, are closely allied to the ancient races, the bones of which are found in the Brazilian caverns; others descended from the table-lands of the Andes and even from the Pacific slope. In Patagonia these various elements underwent a certain degree of amalgamation, but the original differences never entirely disappeared. In the absence of history and traditions, anthropology enables us to recognize very distinct races in the relics collected by explorers from the old burying-places and to throw some light upon a chaos which seemed, at first sight, to be inextricable.

These are the conclusions of a work conducted with absolutely correct method and science and exact in every detail. The International Jury of the L. Angrand Foundation has unanimously awarded to Dr. Verneau the prize in American History and Archæology.

HENRI FROIDEVAUX.

ACCESSIONS TO THE LIBRARY.

NOVEMBER–DECEMBER, 1903.

BY PURCHASE.

AMERICAN BOOK-PRICES CURRENT.—Sept., 1902–Sept., 1903. New York, Dodd, Mead & Co., 1903. 8vo.

BANDELIER, A. F.—The Gilded Man (El Dorado), and other Pictures of the Spanish Occupancy of America. New York, D. Appleton & Co., 1893. 8vo.

BAYLES, RICHARD M.—Historical and Descriptive Sketches of Suffolk County, Port Jefferson, L. I. Published by the Author, 1874. 12mo.

BIOGRAPHIE UNIVERSELLE, ou Dictionnaire Historique, &c. Par une Société de Gens de Lettres. Paris, Furne et Cie, 1838. 6 vols. 8vo.

BOWDITCH, NATHANIEL.—American Practical Navigator. Revised, 1903, under the direction of the Bureau of Equipment, Navy Department, by Lieut. G. W. Logan, U. S. N. Washington, Government Print, 1903.

(CAMPBELL, COLIN) *Translator.*—Ancient and Modern History of the Balearick Islands; or of the Kingdom of Majorca: &c., &c. Translated from the Original Spanish. London, William Innys, 1716. 16mo. [*2 maps.*]

DANMARK og Bilande, Priors Lomme Atlas over. Kjöbenhavn, Vilh. Prior, 1902. Small 4to.

DARCY, JEAN.—Cent Années de Rivalité Coloniale: L'Afrique. Paris, Perrin et *Cie*, 1904. 8vo.

DEMOLINS, EDMOND.—Comment la route crée le type social: Les routes du Monde Moderne. Paris, Firmin-Didot et Cie (1903). 12mo. [Maps.]

DURO, CESAREO FERNANDEZ.—Armada Española: Tomo IX (último). Madrid "Sucesores de Rivadeneyra," 1903. 8vo.

ENCYCLOPÆDIA, NEW INTERNATIONAL.—Vols. XII–XIV. New York, Dodd, Mead & Co., 1903. 8vo.

EVANS, CHARLES.—American Bibliography: Vol. I, 1639–1729. Chicago, Privately printed for the Author, Blakely Press, 1903. 4to.

FURNESS, WILLIAM HENRY, 3RD.—Home-Life of Borneo Head Hunters: Its Festivals and Folk-Lore. (Heliotype Plates.) Philadelphia, J. B. Lippincott Company, 1902. 8vo.

GALLICHAN, WALTER M.—Story of Seville. With Three Chapters on the Artists of Seville by C. G. Hartley. Illustrated. London, J. M. Dent & Co., 1903. 16mo. *Mediæval Towns Series.*

GERLACHE, COMMANDANT DE.—Quinze Mois dans l'Antarctique. *Voyage de la Belgica.* Préface par Elisée Reclus. Bruxelles, Ch. Bulens, 1902. 8vo. [Map and Illustrations.]

GILES, HERBERT ALLEN.—China and the Chinese. New York, Columbia University Press, 1902. 16mo.

HAKLUYT, RICHARD.—Principal Navigations, Voyages, Traffiques and Discoveries of the English Nation. [New Edition.] *Extra Series, Hakluyt Society.* Vols. I–II. Glasgow, James MacLehose & Sons, 1903. [*Illustrated.*]

HARVARD BOOK, THE.—Historical, Biographical and Descriptive Sketches by Various Authors. Collected and Published by F. O. Vaille and H. A. Clarke. Cambridge, Welch, Bigelow & Co., 1875. 2 vols. 4to. *Views and Portraits.*

HELMOLT, H. F. (*Editor*).—Weltgeschichte: Band 8, Westeuropa, Zweiter Teil. Der Atlantische Ozean. Leipzig u. Wien, Bibliographisches Institut, 1903. 8vo. [Maps, &c.]

HELPS, ARTHUR.—The Spanish Conquest in America. New Edition, edited, with Introduction, Maps and Notes by M. Oppenheim. Vols. 1, 2 and 3. [Vol. 4 not yet published.] London and New York, John Lane, 1900–1902.

HENNEPIN, LOUIS.—Description of Louisiana. Translated from the edition of 1683 and compared with the Nouvelle Découverte, &c., by John Gilmary Shea. New York, J. G. Shea, 1880. 8vo. [Map.]

HULBERT, ARCHER BUTLER.—Historic Highways of America. Vol. 9: Waterways of Western Expansion—The Ohio River and its Tributaries. Cleveland, A. H. Clark Co., 1903. 8vo.

LAROUSSE, P.—Grand Dictionnaire Universel du XIX^e^ Siècle. Tome XVII, 2^e^ Supplément. Paris, Administration du Grand Dict. Univ. (1890). 4to.

LEONARD, J. W. (*Editor*).—Who's Who in America, 1903–1905. Chicago, A. N. Marquis & Co. (1903). 8vo.

LEYPOLDT, A. H. (*Editor*).—Publishers' Trade List Annual, 1903. Supplementary Index. New York, Office of the Publishers' Weekly, 1903. 8vo.

MAP.—Balkan-Halbinsel, General-Karte der. Jos. von Scheda. 13 Blätter: 1:864,000. Wien, Artaria & Co., 1897. *Portfolio.*

MAPS.—Denmark and Iceland. Specimen sheets of various scales of the Danish Government Survey, with key-maps, 11 sheets in all. Kjöbenhavn, 1888–1903.

MEDINA, J. T.—Bibliografía Española de las Islas Filipinas (1523–1810). Santiago de Chile, Imprenta Cervantes, 1898. 8vo.

MINERVA.—Jahrbuch der Gelehrten Welt. XIII, 1903–1904. Strassburg, K. J. Trübner, 1904. 8vo.

NETON, ALBÉRIC.—L'Indo Chine et son Avenir Économique. Paris, Perrin et C^ie^, 1904. 16mo.

[NEW YORK CITY.]—Seventh Annual Report of the Board of Commissioners of the Central Park for the Year ending December 31, 1863. New York, Wm. C. Bryant & Co., 1864. 8vo.

PARKER, GILBERT, AND BRYAN, CLAUDE G.—Old Quebec: The Fortress of New France. With Illustrations. New York, The Macmillan Co. 1903. 8vo.

PEARSON, CHARLES H.—Historical Maps of England. 2nd Edition, revised. London, Bell & Daldy, 1870. Folio.

PERNETY, DOM.—History of a Voyage to the Malouine (or Falkland) Islands, 1763–1764, under the Command of M. de Bougainville, etc. Translated . . . [into English]. Illustrated with Copper-Plates. London, T. Jefferys, 1771. 4to.

PETRÒCCHI, P.—Novo Dizionàrio Universale della Lingua Italiana. Milano, Fratèlli Trèves, 1887–1891. 2 vols. 8vo.

PHILIPPINE ISLANDS, 1493–1898. Explorations by Early Navigators, etc., as related in contemporaneous Books and MSS. Translated from the Originals. Edited, etc., by Emma Helen Blair and James Alexander Robertson. Vols. VII and VIII. Cleveland, A. H. Clark Co., 1903. 8vo.

PIERCE, CARL HORTON.—New Harlem Past and Present. With Review of the Principles of Law involved in the Recovery of the Harlem Lands, by William P. Toler and Harmon De Pau Nutting. *Illustrated.* New York, New Harlem Publishing Co., 1903. 8vo.

PREINDLSBERGER-MRAZOVIĆ, MILENA.—Bosnisches Skizzenbuch. Dresden, E. Pierson, 1900. 8vo. [*Illustrated.*]

RENNELL, JAMES.—An Investigation of the Currents of the Atlantic Ocean, and of those which prevail between the Indian Ocean and the Atlantic. London, J. G. & J. F. Rivington, 1832. 8vo. [2 maps.]

ROSS, JOHN.—The Manchus, or the Reigning Dynasty of China. *Maps and illustrations.* London, Elliot Stock, 1891. 8vo.

SCOTT, MICHAEL.—Cruise of the Midge. *Complete Edition, Copyright.* Edinburgh and London, William Blackwood & Sons. s. a., 8vo.

SCOTT, MICHAEL.—Tom Cringle's Log. *New Edition.* Edinburgh and London, William Blackwood & Sons, 1872. 8vo.

STARR, FREDERICK.—The Physical Characters of the Indians of Southern Mexico. [Illustrated.] *Printed from Vol. IV, Decennial Publications University of Chicago.* Chicago, University Press, 1902. 4to.

BY GIFT.

From Cyrus C. Adams, New York:

Map: Signal Corps Telegraph System in Alaska and Canadian Line connecting with the United States. Prepared under the Direction of Brig.-Gen. A. W. Greely, U. S. A. July 1, 1903. *Scale:* 50 miles=1 inch. *Size:* 25¼ x 16⅜ inches.

From the Allgemeiner Verein für Deutsche Litteratur, Berlin:

Reise auf S. M. S. "Möwe." streifzüge in Südseekolonien und Ostasien. Von Johannes Wilda. Karte, etc. Berlin, Allgem. Verein für D. L., 1903. 8vo.

From Edwin Swift Balch, Philadelphia:

Les Français en Amérique pendant la Guerre de l'Indépendance des États-Unis, 1777–1783, par Thomas Balch, Paris, A. Sauton, 1872, 8vo [*map, etc.*]; Letters and Papers relating chiefly to the Provincial History of Pennsylvania, with some notices of the Writers (by Thomas Balch), Philadelphia, Crissy & Markley, *Privately Printed*, 1855, 8vo.

From Poultney Bigelow, Author, New York:

Au Pays des Boers: Le Cap—Lourenço Marquès—Le Natal—Le Transvaal. Paris, F. Juven. s. a., 16mo.

From the British Museum, London:

Report on the Collections of Natural History made in the Antarctic Regions during the Voyage of the "Southern Cross," London, Printed by Order of the Trustees, 1902, 8vo; Monograph of the Tsetse-Flies [Genus Glossina, Westwood], Based on the Collection in the British Museum, by Ernest Edward Austen, London, Printed by Order of the Trustees, 1903, 8vo; Monograph of the Culicidæ or Mosquitoes, &c., by Fred. V. Theobald, *Vol. III*, London, Printed by Order of the Trustees, 1903, 8vo.

From Henry J. Brown, London:

Memoir of Benjamin Franklin Stevens. By G. Manville Fenn. London, Chiswick Press, for Private Distribution, 1903. 8vo.

From Norman W. Browne, New York:

SUMMARY Historical, Geographical and Statistical View of the City of New York . . . Prepared to accompany the Topographical Map of the City of New York, New York, J. H. Colton & Co., 1836, 12mo; MAP of New York City in 1859, by William Perris, *scale:* 6 inches=1 mile, *size:* 34¼ x 23¼ inches, New York, 1859; HAND-BOOK to the Channel Islands . . . by Francis Coghlan, London, Simpkin, Marshall & Co., 1843, 12mo [with map]; MAP of Elizabethtown, N. J., at the Time of the Revolutionary War, 1775–1783, by Ernest L. Meyer, Elizabeth, N. J., 1879, *scale:* 600 feet=1 inch, *size:* 26 x 37⅛ inches. [Mounted on cloth, folded in 4to cover.]

From the Librairie Armand Colin, Editeurs, Paris:

Le Japon d'aujourd'hui: Études sociales. Par G. Weulersse. Paris, Librairie Armand Colin, 1904. 16mo.

From Elmer L. Corthell, C. E. D. Sc., Author:

Report upon Engineering Education. [Reprinted from Technology Quarterly, Vol. XVI, No. 3, September, 1903.] s. l., p., 8vo.

From Henry Frowde, Publisher, London:

Bátū na Abūbuan Hausa. With Translation, Vocabulary and Notes by W. H. Brooks and Lewis H. Nott. London, Henry Frowde, 1903. 16mo.

From the Gebauer-Schwetschke Druckerei, Halle a/S.:

Venezuela und die deutschen Interessen. Von Professor Dr. Wilhelm Sievers. *Mit . . . Karte.* Halle a-S., Gebauer-Schwetschke Druckerei u. s. w., 1903. 8vo.

From Wm. Paul Gebhard, C. E., New York:

Map. Ordnance Survey of the Islands of Bermuda. *Surveyed 1898-99. Published, Southampton, 1902. Scale:* 1 inch=1 mile. *Size:* 18½ x 12¼ inches.

From Gilbert H. Grosvenor, Author, Washington:

The Tetrahedral Kites of Dr. Alexander Graham Bell. *Reprinted from the Popular Science Monthly, December, 1903.* p., 8vo.

From Dr. Guy Hinsdale, A.M., M.D., Author, Philadelphia:

The Climate of New England, *Reprinted from International Clinics, Vol. I, Twelfth Series,* Philadelphia, J. B. Lippincott Co., 1903, p., 8vo; Mineral Water Resorts [*Part II of Reprint from the Transactions of the American Climatological Association, 1902*], London, John Bale, Sons & Daniellson, 1902, p., 8vo.

From A. de Lapparent, Author, Paris:

Three extracts from the Comptes rendus des séances de l'Académie des Sciences: Tome CXXXII (1901), p. 388; Sur la découverte d'un Oursin d'âge crétacé dans le Sahara oriental: Tome CXXXVI (1903), p. 1118; Sur les traces de la mer lutétienne au Soudan: Tome CXXXVII (1903), p. 827; Sur la Signification géologique des anomalies de la gravité. [Pamphlets, 4to.]

From Longmans, Green & Co., New York:

Round Kangchenjunga. By Douglas W. Freshfield. With illustrations and maps. London, Edward Arnold, 1903. 8vo.

From Benjamin Smith Lyman, Author, Philadelphia:

Silver-Mining and Smelting in Mongolia, Discussion of Mr. Y. T. Woo's Paper [*From the Transactions of the American Institute of Mining Engineers,* 1902]; Biographical Notice of J. Peter Lesley [*From the Transactions of the American Institute of Mining Engineers,* 1903.]

From the Macmillan Co., New York:

Geography of Commerce, by Spencer Trotter, New York, The Macmillan Co., 1903, 8vo [*Maps and illustrations*]; Pleasure-Book of Grindelwald, by Daniel P.

XUM

Rhodes, *with many illustrations*, New York, The Macmillan Co., 1903, 8vo; History of Coinage and Currency in the United States and the Perennial Contest for Sound Money, by A. Barton Hepburn, New York, The Macmillan Co., 1903, 8vo.

From Francis C. Nicholas, M. Sc., Ph.D., New York, Author:

Around the Caribbean and Across Panama. *With maps, etc.* Boston and New York, H. M. Caldwell Company (1903). 8vo.

From the Department of the Interior, Ottawa, Canada:

MAP of Alberta and Western Portions of Saskatchewan and Assiniboia, 1903, *scale:* 12½ miles = 1 inch, *size:* 25 x 35 inches; BANFF Sheet and Lake Louise Sheet of the Topographical Map of the Rocky Mountains, *scale:* 2 miles to 1 inch, 1902, *size:* Banff Sheet, 18½ x 13⅝, Lake Louise Sheet, 19¾ x 17 inches; MAP of Yukon District with the adjacent Northern Part of British Columbia, 1903, *scale:* 11.84 miles = 1 inch, *size:* 28 x 39½ inches.

From Paul Parey, Publisher, Berlin:

Die geographische Verteilung der Getreidepreise in den Vereinigten Staaten von 1862 bis 1900. Von Th. H. Engelbrecht. Mit 24 Kärtchen auf 8 Tafeln. Berlin, Paul Parey, 1903. 8vo.

From Carl Ernst Poeschel, Publisher, Leipzig:

Grundzüge der Handels- und Verkehrsgeographie, von Dr. Emil Deckert. 3te Auflage. Leipzig, Verlag von Carl Ernst Poeschel, 1902. 8vo.

From G. P. Putnam's Sons, New York:

Danish Life in Town and Country. By Jesse Brochner. Illustrated. New York and London, G. P. Putnam's Sons, 1903. 12mo.

From Miss Ellen Churchill Semple, Author, Louisville, Ky.:

American History and its Geographic Conditions. Boston and New York, Houghton, Mifflin & Co., 1903. 8vo.

From W. D. Scott, Superintendent of Immigration, Ottawa, Canada:

The Canadian Year-Book for 1903. Toronto, Canada, Alfred Hewett, 1903. 8vo.

From Franz Siemenroth, Berlin:

Brasilien und seine Bedeutung für Deutschlands Handel und Industrie. Von Dr. Walther Kundt. Berlin, Franz Siemenroth, 1903. 8vo.

From Wilhelm Süsserott, Berlin:

Wie rüste ich mich für die Tropenkolonien aus? Von Ernst Tappenbeck. Berlin, W. Süsserott, 1903. 8vo.

From Prof. Ralph S. Tarr, Author, Ithaca, N. Y.:

Postglacial and Interglacial (?) Changes of Level at Cape Ann, Massachusetts. With a Note on the Elevated Beaches by J. B. Woodworth. *Bulletin of the Museum of Comparative Zoölogy at Harvard College, Vol. XLII, Geol. Series, Vol. VI, No. 4.* Cambridge, Mass., 1903. p., 8vo.

From B. G. Teubner, Publisher, Leipzig:

Aus Deutsch-Brasilien. Von Alfred Funke. Leipzig, B. G. Teubner, 1902. Square 8vo. [*Map and illustrations.*]

From the Department of State, Washington:

Alaskan Boundary Tribunal: The Case of the United States; The Argument of the United States; The Counter-case of the United States. *With two accompanying Atlases.* 3 vols. 8vo, 2 vols. folio. Washington, Government Printing Office, 1903.

From N. H. Winchell, Author, Minneapolis:

Pleistocene Geology of the Concannon Farm, near Lansing, Kansas. *From the American Geologist, May, 1902.* p., 8vo.

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OBITUARY.

Rear-Admiral Bancroft Gherardi, U. S. N.

Born at Jackson, Louisiana, November 10, 1832.
Died at Stratford, Connecticut, December 10, 1903.

Bancroft Gherardi was a nephew of George Bancroft, the historian, under whom, as Secretary of the Navy, the Naval Academy was established at Annapolis in 1845. Young Gherardi entered the navy as a midshipman in 1846 and served on the *Ohio* of the Pacific squadron until 1850, when he entered the Naval Academy and was promoted to Passed Midshipman in 1852. He was then ordered to the *St. Louis*, on the European station, and after some years to the Home squadron. In 1858 he was navigating officer of the *Niagara* when that ship was employed in laying the first Atlantic cable.

In the Civil War he was commissioned as Lieutenant-Commander in 1862, took part in the attack on Fort Macon, and served in the West Gulf blockading squadron. In command of the *Port Royal*, of that squadron, he fought in the battle of Mobile Bay, in which his ship was so badly damaged that she was laid up for repairs and Lieut. Gherardi was transferred to the command of the *Pequot*, of the North Atlantic blockading fleet.

In 1866 he was made Commander, Captain in 1874, Commodore in 1884, and Rear-Admiral in 1887. During these twenty-one years he was constantly on duty on the home station or abroad. His sea-service ended in 1892, when he arrived at Hampton Roads with the Pacific squadron and took command of all the United States ships assembled for the great review in commemoration of the fourth centenary of the Discovery. The same year he was placed in charge of the New York Navy Yard, and there remained until retired from active service in 1894.

He became a Fellow of the American Geographical Society in 1894 and a Councillor in 1895. Failing health compelled him to resign his seat in the Council in 1902.

Admiral Gherardi's manly and amiable character won the respect and the affection of all who were brought into close relation with him.

TRANSACTIONS OF THE SOCIETY.

NOVEMBER–DECEMBER, 1903.

A Regular Meeting of the Society was held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, November 17, 1903, at 8.30 o'clock P.M.

In the absence of a presiding officer, the meeting was opened by the Librarian.

The following persons, recommended by the Council, were duly elected Fellows by vote of the Society:

Evans R. Dick.	James Armstrong.
Simon Guggenheim.	William Porter Allen.
Daniel Bacon.	F. W. Bennett.
Henry A. Lloyd.	Nathan Appleton.
Alvah D. James.	Dr. Willis E. Everette.
Edward D. Sniffen.	J. H. Cuntz.
Gates D. Fahnestock.	Richard C. Veit.

Prof. E. L. Stevenson, of Rutgers College, was then introduced. He addressed the Society on Martin Waldseemüller and the Early Lusitano-Germanic Cartography of the New World.

Maps were shown on the screen.

On motion, the Society adjourned.

A Regular Meeting of the Society was held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, December 15, 1903, at 8.30 o'clock P.M.

Vice-President Moore in the chair.

The following persons, recommended by the Council, were elected Fellows:

Edward L. Hale, William J. Burnett, B. Drake-Smith;

and Horace E. Williams, of São Paulo, Brazil, was elected a Corresponding Member.

The Chairman then introduced the speaker of the evening, Dr. Frederick A. Cook, who described his expedition to Alaska and his attempt to make the ascent of Mt. McKinley.

Stereopticon views were shown.

On motion, the Society adjourned.

BOOK NOTICES.

American History and its Geographic Conditions. By Ellen Churchill Semple. Houghton, Mifflin & Co., Boston, 1903. 466 pp., 16 maps.

American History and its Geographic Conditions: Under this rather cumbersome title is included an exceedingly scholarly treatment of the operation of geographic influences in American history. Appearing, as it does, almost simultaneously with Brigham's Geographic Influences in American History (reviewed in this number of the BULLETIN), one naturally compares the two books in order to see how two different authors approach the same general subject. The interest in this comparison becomes still greater because of the fact that these two books are pioneers in a large field destined in the future to be exploited from many points of view. It requires but a cursory examination to discover that the two works are absolutely different, and, moreover, that they really supplement one another. In Professor Brigham's book, as might be expected, the basis is physiographic, and from this basis numerous geographic influences are considered. The very division of the subject by chapters is made on physiographic lines. In Miss Semple's book, on the other hand, the basis is historical, and in the course of the unfolding of the history of the United States it is shown what geographic influences have been in operation.

Starting in Chapter I with the maritime history of Europe, in which the significant facts relating to the discovery and exploration of America are briefly indicated, the author proceeds in Chapter II to a study of the rivers, pointing out their importance in the explorations for the Northwest Passage and as pathways for the fur trade. Not only the large but even the small rivers are considered in this excellent statement of the influence of rivers on early exploration and settlement. The importance of the Appalachian barrier warrants the assignment of two chapters, the first treating of its influence upon colonial history, the second of its influence in the guidance of the westward movements of the pioneers. In the fifth chapter the geographical position of the trans-Allegheny settlements is considered, especial attention being paid to the influence of the Appalachian barrier in separating them from the Coast States, as well as of the Mississippi River as an avenue of trade toward the

Gulf. This naturally leads to a consideration, in Chapter VI, of the Louisiana Purchase, which, as Miss Semple shows, simply anticipated what must eventually have come about as a result of geographic influences, namely, the assembling of the various parts of the Mississippi Valley under one control.

Then follow chapters on the "Geography of the Atlantic Coast in Relation to the Development of American Sea Power"; the "Geography of Sea and Land Operations in the War of 1812"—the best treatment of this topic that the reviewer has seen; and "Spread of Population in the Mississippi Valley as Affected by Geographic Conditions," including a very clear statement of the causes operating toward the separation of Texas from Mexico. Chapters X and XI consider the nature of the movement westward across desert and mountain and clearly show how important the rivers were in guiding these early movements. Strangely, neither here nor elsewhere in the book are the Mormons mentioned. It is, of course, a delicate question to handle, but failure to treat it leaves an important gap in an otherwise complete whole. In this connection it may be said that the general subject of irrigation and its influence seems to have demanded fuller treatment than it receives.

Chapter XII points out clearly the reasons why the United States naturally expanded as it did, becoming a great continental power, and also shows how the surroundings and opportunities have reacted to influence American character. In the next chapter it is shown how important are the inland waterways, how their development by aid of canals was checked by the incoming of railways, and how important it now is to improve them properly by adequate canals. There is in Chapter XIV a vivid picture of the geographic influences operating in the Civil War, especially in the campaign around Richmond. "The Geographical Distribution of Immigration," discussed in Chapter XV, considers the nature and causes of the distribution, and closes with a statement of the turn of tide to immigration out of America into Canada. Chapter XVI, "Geographical Distribution of Cities and Industries," is a broad treatment of general principles, and is one of the least specific in the book. Chapter XVIII discusses the "Geographical Distribution of Railroads."

The entire book is an argument for expansion, and it is evident that Miss Semple's studies have led her to the belief that America's destiny to reach out over the world is a result of the operation of geographical laws. Doubtless, many will not agree to the adequacy of all the reasons she sets forth, or that she has fully taken into

account all causes that are operating. Nevertheless, she makes a strong case, and the book can be recommended to anti-expansionists as one that certainly shows the main arguments of the other side clearly. Especially in the last two chapters—one on "The United States in relation to the American Mediterranean," the other on "The United States as a Pacific Ocean Power"—are the nature and causes of expansion most fully treated. In the first of these it is shown how important it has been to gain a foothold in the West Indies; and this chapter might even be used by President Roosevelt in defence of the Panama policy of the Administration, although written before it was adopted. This chapter also gives a statement of the striking development of commerce in the Gulf region, the drift of trade down the Mississippi, as is natural, and the marked growth of New Orleans. That our expansion across the Pacific is a result of geographic conditions is the burden of the last chapter, in which it is pointed out that our position on two oceans demands a development in each, and that the apparent jump, which has caused so much uneasiness, is merely the logical extension of our entire national policy and development, now taking a somewhat new form when the water frontier is reached. Miss Semple spares the feelings of the Canadians in not making a point of the resemblance between the extension of American influence into Texas and the recently begun movement of Americans into Western Canada. Will her law operate here?

Miss Semple's book will find a wide audience, for it appeals to people of many interests. The time has arrived when educated people in general should know not merely that United States has grown and that it has had a certain history, but why this has been so. This book states these reasons along many lines. Moreover, it states them clearly and convincingly, and evidently upon the basis of wide research and knowledge. It is a marked book, not merely because one of the first of its kind on this subject, but because it is an adequate treatment of the subject.

R. S. T.

*Geographic Influences in American History.**—In preparing this book Professor Brigham has broken a new path, along which others will doubtless follow. The book commands attention not alone because written by an American geographer of high rank, but also because it is the first book to treat scientifically of the intimate

* *Geographic Influences in American History, by Prof. Albert P. Brigham, 366 pp., Ginn & Co., Boston, Mass.*

relation between physiography and American national development. This is a large subject and a difficult one, for it is on the border line between two comprehensive divisions of knowledge. To cover the ground well, and especially in the small compass of a book of little more than 350 pages, calls not only for extensive knowledge, but also for marked skill in handling the task.

To accomplish his object of presenting a large subject in a small compass the author has centred his description around several large topics of marked importance. His first theme, "The Eastern Gateway of the United States," tells with great clearness the wonderful story of the Mohawk valley and its influence on the development of lines of travel and transportation and the growth of industries and cities. While throughout the book the literary style is excellent and well calculated to hold the interest, this first chapter seems to excel the others in these respects.

The second chapter, entitled "Shore-Line and Hilltop in New England," has a less compact theme, and is consequently more disjointed. It, moreover, enters rather farther into the purely physiographic phases of the subject. But one cannot read this chapter without gaining a realization of the profound influence of physiography on New England life, which, as Brigham shows, impresses itself even on the literature of the best New England writers. It is an excellent characterization of New England conditions and their relation to causes. Not a few New Englanders have not yet, however, schooled themselves to the belief that the future of this section is so economically dark as might be inferred from the author's partial prophecies. It is doubtless true that New England is geographically better fitted to become a summer resort and a producer of building stones than to lead in cotton manufacturing; but the future, like the past, may supply examples of conditions which seem to defy the laws of "geographic control." The decline of New England is much talked of, but is much less a fact than would be inferred from many of the statements about it.

Chapter III presents the clearest and best description of "The Appalachian Barrier" and its effects that the reviewer has seen; and the next chapter, under the title of "The Great Lakes and American Commerce," gives a clear and interesting statement of the importance of the Great Lakes and Niagara. The author's outline of the future possibilities of the lakes, supplemented by proper canals, and his discussion of the possible diversion of trade from the Central States to Southern ports, are full of interest to

New York people at the present time, when the undertaking has been determined upon of endeavouring to provide for the retention of the interior traffic along the natural eastern gateway.

"The Prairie Country" is treated in Chapter V, and "Cotton, Rice, and Corn" in Chapter VI. The latter chapter gives a strong picture of the geographic reasons for believing in a great future for the South, as well as a clear, striking statement of her past as guided by geographic influences. The remaining chapters, each worthy of special comment, bear the following titles: "The Civil War," "Where Little Rain Falls," "Mountain, Mine, and Forest," "From the Golden Gate to Puget Sound," "Geography and American Destiny," and "Government Study of our Domain." The book is illustrated by 72 well-selected pictures, reproduced as half tones, and 16 maps.

While the book aims primarily to show the influence of geographic conditions on the development of a great nation, Professor Brigham again and again makes it clear that he is not so blinded by his own special interest as to think that geographic influences *control*. Yet he falls into the use of the phrase "geographic controls," which comes so easily to some physiographers.

The appearance of Professor Brigham's book is an important event, marking as it does the first organized excursion into this great borderland by an American physiographer. It cannot but have an influence of importance in other directions than in leading the way. It will bring before the geographer a statement of many points of relation of his science to history; and the historian it will remind of what is sometimes overlooked—that there are many geographic factors of value in human development. Teachers in all lines of geography will find the book of value in their work, and so, also, ought the teacher of history. Moreover, the book will be read by many for the mere pleasure of reading a delightfully-written text on a theme of general interest, presented from a new standpoint.

R. S. T.

L'Architecture du Sol de la France, by Commander O. Barré. pp. 111 and 393, with 189 figures and plates. Paris, Armand Colin, 1903.

L'Architecture du Sol de la France is one of the best and most detailed studies of the geomorphology of a large area that has yet appeared. The author has made use of all the modern principles of geomorphology and has applied these principles to a careful and comprehensive study of the development of France. The state-

ments of the text are illustrated by many maps, sections, and perspective drawings, which give a vividness and clearness to the exposition such as the text alone could not give.

The introduction is devoted largely to a summary of the processes of continental growth and development, so familiar to all who have followed the work of Davis, Gilbert, Hayes, de Margerie, and others within the last decade and a half. Following these general matters the author has inserted a brief summary of the geographical history of Europe, in which he has incorporated a number of maps showing the outline and extent of the continent during the several geological periods. He further divides the existing highlands of Europe into two groups according to whether their general form is tabular or folded. In the former group he places the plateau of Bohemia, the Central Plateau of France, the Vosges, the Ardennes, and the highland of Central Germany; in the latter the Pyrenees, the Alps, the Jura, the Apennines, the Carpathians, and the Balkans. Thus the larger part of France may be considered as belonging in the first group, which includes the region of Aquitania and the Anglo-Parisian area. This latter area is seen in France in the so-called Paris Basin, a term which the author does not approve, because it does not give proper emphasis to the extent of the geographical conditions existing during the period when the rocks now seen about Paris were deposited.

The physical divisions of France in which there has been a unity of genetic development are the North and Northwest, north of Paris and the lower Seine; the Northeast, from Paris to the Rhine and including the upper Saône; the East and Southeast, including the Alps and the Rhone; the South and Southwest, including the Pyrenees and Aquitania; the West, that is, Brittany; the Central Plateau and the coastal area.

In the detailed treatment of each division the author considers first the geological and geographical history in a broad way, and then takes up the detailed treatment of the several subdivisions. In all his work we find evidence of a deep and personal knowledge not only of the surface features of France but of the geological history and the contributions of others to the interpretation of this classic region. The effects of structure upon form and drainage have been worked out carefully, and the relations between diverse regions have been emphasized through a presentation of the earlier geographic conditions attested by a study of the origin of sediments and of the existence of peneplains revealed by the removal of covers laid down in the earlier epochs. Although the author

follows carefully the evidences of various cycles of erosion in the different regions, he does not limit himself to the larger generalizations, but includes a detailed consideration of the history of ancient areas of erosion and deposition, so that the conditions of the present are viewed in the light of the detailed history of the past. The evidences of buried peneplains, the effects of faulting, folding and thrust-faulting upon the ancient land forms, are constantly brought out, and it is clearly shown how much the tectonic history contributes to the understanding of the present surface forms.

The reader of the volume cannot but be impressed with the large contributions to the science which have been made by American geographers. The effects of faulting and folding upon ancient land forms, which have been emphasized by Hayes and Campbell in their study of the Southern Appalachians, by Davis in his classic papers of the Triassic Area of the Connecticut Valley, and by Hobbs in his papers on Southwestern New England, are here emphasized with even a greater detail.

The volume is one of the most helpful contributions to regional morphology at present available, and should receive a warm welcome in America. The descriptions given are clear, concise, and convincing, and the work as a whole is most satisfactory, both scientifically and from the standpoint of good book-making.

R. E D.

Report on the Collections of Natural History Made in the Antarctic Regions during the Voyage of the "Southern Cross." London, Published by order of the Trustees of the British Museum, 1902. pp. 344, 53 plates and numerous text-figures.

This volume is among the first fruits of systematic expeditions into the Antarctic regions. It comprises a series of reports by no less than twenty-four specialists on the animals, plants, and minerals collected during the voyage of the *Southern Cross*. As we are told in the preface by Prof. E. Ray Lankester, Director of the British Museum, the *Southern Cross* was fitted out by Sir George Newnes in 1898 to sail for Victoria Land. It was shut up in the ice-pack for forty days, during which time the young naturalist of the expedition, Mr. Nicolai Hansen, made large collections of birds and seals. In October, 1899, Mr. Hansen died. His notes were lost, and his collections suffered considerably from neglect on the part of the surviving crew. Under the circumstances, it is rather surprising that the various specialists have been so successful in working up the material.

The mammals collected comprise four species of seals (Weddell's Seal, the White Seal, Ross's Seal and the Seal-leopard). There are twenty-four species of birds, including three penguins, eleven petrels, five albatrosses, four terns and gulls, and a cormorant. None of the birds and mammals are new to science. As would be expected, the collections of fishes and invertebrates present a number of hitherto unknown forms. There are eight new species of fishes and three new genera, four new Tunicates, fifteen new mollusks, two insects, one mite, fourteen Crustaceans, three Polychaeta, one Polyzoon, one Alcyonarian, and two sea-anemones, making a total of forty-three new species. Both these and the collections of the known forms show that the Antarctic fauna is singularly poor in species. Nor are any of the forms of a striking or remarkable character, with the possible exception of the penguins, a few of the crustaceans, like *Paratanais antarctica*, and the two sea-anemones (*Urticina sulcata* and *U. carlgreni*), which have brood-pouches for their eggs. These pouches are formed by invaginations of the outside body-wall, and are known to occur only in sea-anemones from the Antarctic and Arctic regions. A similar condition is known to occur in Arctic and Antarctic Echinoderms. It has been suggested that the surface ice in the polar regions may be fatal to the free-swimming larvæ of sea-anemones and Echinoderms, so that the creatures have provided brood-pouches in which their young can develop directly, *i.e*, without a free larval stage.

The volume is provided with a series of fifty-three photolithographic plates illustrating the new and some of the already known species. The figures of the seals and penguins are especially interesting. The paper and press-work are excellent, but the binding is too weak. W. M. W.

A Monograph of the Tsetse-flies (*Genus Glossina, Westwood*) *based on the Collection in the British Museum. By Ernest Edward Austen, with a Chapter on the Mouth-parts by H. J. Hansen, Ph.D. London, 1903.*

The recent discovery that certain flies are carriers of disease has given a great impetus to monographic work on groups of two-winged insects that have long been neglected by systematic entomologists. The interest in malaria has called forth a superb monograph on the mosquitos of the world, published under the auspices of the British Museum. The same institution has now given us a companion volume on the Tsetse-flies, which have been

shown by Surgeon-Major David Bruce to be the carriers of the Nagana disease of cattle, horses, mules, and donkeys in certain parts of Africa. Mr. Austen, the dipterologist of the British Museum, has brought together in this volume of 319 pages, illustrated by several clear text-figures and a series of nine excellent plates, literally all that is known about these interesting insects. The Tsetse-flies are allied to our common stable-fly, a gray, biting species often confounded with the common house-fly. Seven species of the Tsetse (Glossina) are carefully described. One of these (*G. pallidipes*) is new to science. As shown by a good map of their distribution, the insects are most prevalent along the water-courses of Africa. In these regions they occur in peculiar "fly-belts," the crossing of which is often attended by no little danger to the pack-animals. The reproduction of the Tsetse presents a curious phenomenon, hitherto known to occur only in certain flies (*Hippoboscidæ*), parasitic on birds and mammals. The Tsetse does not lay eggs like the vast majority of flies, but a single brown puparium. In other words, a single egg hatches within the reproductive organs of the parent fly, and there passes through its entire larval and incipient pupal stages, being in all probability nourished by certain glandular secretions. Thus the insect produces very few young, but these are not subjected to all the vicissitudes which decimate the much larger broods of ordinary flies. Mr. Austen has accumulated a vast amount of data on the habits and distribution of the Tsetse, as shown by his extracts from one hundred and seventy-four works by travellers and observers who treat more or less incidentally of the insect. He also appends a bibliography of thirty-four works that have already been written on the Nagana disease. This disease is produced by a blood-parasite (*Trypanosoma brucei*), belonging to the same group of microscopic organisms as the malarial *plasmodium*. *Glossina morsitans* is the species most concerned in the transmission of the Trypanosoma. The disease is most prevalent in "German East Africa, British East Africa, and Somaliland, on the east, and in the German protectorate of Togo on the west." It is probable, however, that the other species of Tsetse may carry the disease in the regions over which they occur. It has not yet been demonstrated that Nagana may not be carried by other blood-sucking flies besides Glossina (*e. g.*, *Tabanidæ*). Nor has it been possible to show that Nagana is identical with the disease known as Surra in India. The appendices to Mr. Austen's work contain, among much interesting matter, an excellent abstract of Surgeon-Major Bruce's report of the experiments by means of which he was able to demonstrate the

true nature of the Tsetse-fly disease. A chapter on the anatomy of the mouth-parts of the insect, together with two plates, by Dr. H. J. Hansen, of Copenhagen, is included in the work.

W. M. W.

*Geology of Worcester, Mass.** This volume deals almost exclusively with the hard rock geology of Worcester and immediate vicinity, being based upon work done by Emerson and Perry for the U. S. Geological Survey. The selection of the material and its presentation are the work of Mr. Perry, and he has performed his task exceedingly well. Since the volume is intended, not for geologists, but for the people of Worcester, it is written in as untechnical language as possible. There are many excellent half tones of rock outcrops and hand specimens.

This publication speaks well for the energy of Mr. Perry and the broadmindness of the Worcester Natural History Society. Most such societies are content with mere existence, or, at best, with occasional meetings and the formation of a museum. The Worcester Society is setting before others an excellent example of what they may well do—namely, illustrate and explain to the people the natural history of their surroundings. This, of course, requires also the willingness of a member to do the work; and the Worcester Society is fortunate in having such a member as Mr. Perry.

R. S. T.

International Bibliography of Meteorology.—Volume F of the *International Catalogue of Scientific Literature* contains the titles in Meteorology (including Terrestrial Magnetism) for the year 1901. There are fifty-three pages in the authors' catalogue, and sixty-eight in the subject catalogue. "Climatology and Weather" occupy about twenty pages. The classification of climatology is into four heads—General, Agricultural, Phenological, and Hygienic. Under each of these subdivisions there is a classification by countries. The Bibliography is certain to be of great service to all working meteorologists and climatologists, albeit the first volume is singularly incomplete in giving no reference to the *Meteorologische Zeitschrift*, the leading meteorological journal of the world, nor to the *Sitzungsberichte* and *Denkschriften* of the Vienna Academy of Science, both of which publications frequently contain valuable monographs on meteorological and climatological subjects. R. De C. W.

* The Geology of Worcester, Massachusetts, by Joseph H. Perry and Benjamin K. Emerson. Published by the Worcester Natural History Society, Worcester, Mass., 1903.

Grundzüge des Handels und Verkehrsgeographie. Von Dr. Emil Deckert. Dritte Auflage, pp. 389. Index. Carl Ernst Poeschel. Leipzig, 1903. (*Price, 4.20 marks.*)

Dr. Deckert's Commercial Geography has established its position as an authoritative book. The first 56 pages are given to the principles underlying the production and handling of commodities. The European countries occupy 186 pages, and other countries are very concisely treated. The United States is covered in 18 pages. The book is a compendium of important facts relating to products, trade, and transportation. Teachers of commercial geography who read German will find the work helpful.

Brasilien und seine Bedeutung für Deutschlands Handel und Industrie. Von Dr. Walther Kundt. pp. 119. Franz Siemenroth, Berlin, 1903.

The central idea of this book is that the German people will derive the greatest advantage in the long run by establishing trade with those newer regions, like the German colonies in Brazil, where German capital and labour may be largely interested in the work of development. In addition, the book is a clear and methodical monograph upon the economic status of Brazil.

Wie rüste ich mich fur die Tropenkolonien aus? Von Ernst Tappenbeck. pp. 56. Wilhelm Süsseroth, Berlin, 1903. (*Price, 1 mark.*)

Mr. Tappenbeck writes of the equipment required for convenience, comfort, and health during a sojourn in the tropics. He treats the food question with especial fulness; and also offers many suggestions which, though they may relate to small matters, have an important relation to comfort and success, and had better be learned from a book like this than from unpleasant experience. He does not discuss questions of trade or the fitting out of expeditions, as what is adapted for one region may not be for others.

Venezuela und die Deutschen Interessen. Von Dr. Wilhelm Sievers. pp. 107. Angewandte Geographie. Bd. 1, No. 3. Halle a S., 1903. (*Price, 2 marks.*)

The new periodical devoted to applied geography, or, in other words, to geography in its relation to the progress of human development, has thus far presented papers by Dr. Thomas Lenschau on Ocean Cables, and by Dr. Paul Rohrbach on the Economic Importance of Western Asia. The third number contains Dr.

Sievers' paper on Venezuela. It is gratifying to see that he has distinctly separated his political allusions from his geographical treatment of the subject, for which he is more especially qualified. He gives a third of the book to the geography of Venezuela, a quarter to its products, industry and trade, and the remainder to the people and government. No one is better prepared than Dr. Sievers, who has studied Venezuela on the ground, to give an accurate portrayal of the country in these aspects. It is much to be desired that similar convenient and accurate sources of information for other parts of Latin America be made accessible.

Jahrbuch der Naturwissenschaften, 1902–1903. Eighteenth Year. Edited by Dr. Max Wildermann. pp. xii + 508. Forty-six woodcuts and two small maps. B. Herder, St. Louis, Mo., and Freiburg-im-Breisgau, 1903. (*Price, $2 net.*)

Dr. Wildermann had the assistance of twelve or fifteen specialists of Germany in the preparation of this record of the progress made in a year in the leading sciences and technical pursuits. Dr. Franz Heiderich, of Vienna, tells in 32 pages what was accomplished by explorers and surveyors in all parts of the world. His summary is excellent and thorough, but it is necessarily very concise. Its helpfulness would be increased if reference were given in every case to works in which fuller information is attainable. Anthropology, ethnology, and meteorology are other subjects treated, of especial interest to geographical students.

Die Vereinigten Staaten von Nordamerika. Von Dr. Otto Hötzsch. 180 pp., 111 illustrations, and a map in colors. Velhagen & Klasing, Bielefeld und Leipzig, 1904. (*Price, 4 marks.*)

This is a finely-illustrated monograph on the history of the United States. Although the matter is necessarily compressed, the writer has succeeded in conveying sound information, and has closely linked our past with our present, so that the German reader may get a clear idea of the nation as it is and of the influences that have developed it. The book is well indexed.

Köln am Rhein. Von George Hölscher. Hoursch & Bechstedt, Koln a/ Rh., 1902.

A small but quite complete guide-book to Cologne, with many illustrations, plans of principal theatres, an excellent coloured map of the city, and a sketch map of the environs, illustrating half-day and whole-day excursions. The book is fully indexed.

Précis of information concerning the Uganda Protectorate. Compiled in the British War Office by Brevet-Major E. M. Woodward. London, 1902.

This book of 158 pages is a condensed account of the geography, resources, population, industries, and communications of the Uganda Protectorate. Appendix I is devoted to a description of the roads by which the various parts of the Protectorate are reached. In Uganda province the natives are keenly alive to the value of good roads, and co-operate with the British authorities in the gradual extension of the road system. Fairly good roads extend from Mengo, the native capital, to Unyoro province, which borders Albert Nyanza, and to other distant regions, as Toru; Buddu, and Ankole. These roads are from 25 to 30 feet broad, and are remarkably straight. The local chiefs are responsible for their maintenance, and the track is kept in fairly good condition in the well-populated districts. Nearly all the narrower streams have been bridged, but the bridges are not strong enough for wheel traffic. Communications off the main road are maintained by narrow and tortuous footpaths; and on the streams by native canoes. Victoria Nyanza is navigated everywhere, but sunken rocks in the channels between the islands and the mainland require great care in navigation. Entebbe, the administrative headquarters of the Protectorate on the northwest shore of the lake, is reached by steamer in two days from Port Florence, the lake terminus of the railroad.

The value of the book is increased by maps, one showing the routes through the country, another the provinces and districts into which the Protectorate is divided; while a map of the Protectorate in four sheets, on a scale of 10 miles to an inch, shows topography, drainage, and place-names.

Batu na Abubuan Hausa. With translation, vocabulary and notes. By W. H. Brooks and Lewis H. Nott. 56 pages. Henry Frowde, London, 1903.

This little book presents a number of very short pieces written in the Hausa language by an intelligent native, descriptive of Hausa warfare, fisheries, hunting, agriculture, and building. An English translation and vocabulary follow. As the introduction gives the Hausa alphabet, the pronunciation, and the system of transliteration, the book both adds a little to the small stock of Hausa prose, and will also help the student in his general study of the language.

A Search for the Masked Tawareks. By W. J. Harding King. 334 pp., 41 Illustrations, Map and Index. Smith, Elder & Co., London, 1903. (*Price, 12 sh.*)

Mr. King contributes a new spelling of the word commonly written Tuareg in English, because he thinks the form Tawarek most nearly represents the correct pronunciation; but he saw very few Tuaregs, and is he certain that the spelling he uses represents the prevailing pronunciation? It is confusing to multiply spellings of a name; and a form practically settled in general usage should not be disturbed without the best of reasons.

The book does not disclose the time of Mr. King's journey into the Sahara, but it was evidently some time before the recent military expeditions of Lieut. Cottenest and Capt. Laperrine to the Hoggar mountains proved, apparently, that the Tuaregs are really very weak in numbers and in fighting power, though hitherto supposed to be formidable. Mr. King shows that they are widely scattered over the Sahara; but all the evidence collected in the past two years is to the effect that they can offer no serious opposition to foreign occupancy since the French have learned the art of rapid desert travelling.

Mr. King's journey extended only from Biskra to Wargla, and then northeast to El Wad, where he finally caught his Tuaregs. He learned little that has not been told by Duveyrier and later writers. He was able, however, to secure some photographs of men and women. Other fine pictures illustrate desert travel, and life in the Saharan towns and oases. The vivacious narrative gives the book a fascinating quality, and conveys an excellent idea of the oases regions to the south of Biskra.

A Handbook of Modern Japan. By Ernest W. Clement. Maps and Illustrations. 395 pp. Index. A. C. McClurg & Co., Chicago, 1903. (*Price, $1.50.*)

This work, as its title indicates, is not a book of travel or of geographical description. Its topics relate to the Japan of the present in its material, intellectual, political, and other aspects. It is not encyclopædic, but gives a clear idea of the things that are most important in the life of the individual and the nation. The reader will be helped by it to understand the moving impulses in all phases of Japan's activities. The specialist will not discover in the book all the material he needs, but at the end of each chapter are full references to the best sources of more complete

knowledge, and these bibliographies are very important features of the volume. The map is commonplace, and shows topography only in a crude manner.

The writer says that the study of the English language may begin in the higher elementary school of Japan, and is required in every middle school which corresponds to our high school. We may look upon the attention given to the English language in Japanese schools as one of the means by which our relations of friendship and business with that empire will be facilitated.

Le Japon d'aujourd'hui. Par G. Weulersse. 364 pp. Armand Colin, Paris, 1904.

The book will prove welcome as an aid to the study of modern Japan. Its chief topics are the geography of the country, the leading cities (Tokio, Kioto, and Osaka), agriculture, the manufacturing industries, education, and the position of Japanese women.

The farmers of Japan appear to be progressive. M. Weulersse says that, in addition to the variety of native fertilizers, phosphates and other chemical agencies for enriching the soil are coming into use. Twenty-seven per cent. of the area under rice now yields two crops a year. From 1892 to 1896 the extent of the tea plantations diminished, but the improved methods of tillage increased the production 17 per cent.

The Engineer in South Africa. By Stafford Ransome, C.E. 320 pp. Maps and Illustrations. E. P. Dutton & Co., New York, 1903. (Price, $2.50 net.)

Though this book was written by an engineer, it is not technical, but is adapted to edify and interest all intelligent persons who, for any reason, would like to possess accurate and solid information about South Africa. The chapters on industrial geography, international colonial relations, the harbours of South Africa, interior communications, diamond and gold mining, irrigation and labour problems, are especially valuable in their geographic and economic relations. So full a description of the harbours, with their lamentable limitations and the methods of development and improvement required, does not appear in any of the larger books on South Africa. A full description of Saldanha Bay is given, with a map and pictures. This almost ideal natural harbour on the

Atlantic coast, sixty miles north of Cape Town, is now to be developed. A large part of it is entirely landlocked, it is large enough to contain at one time ten times as many ships as now visit the ports of South Africa, and has "so much depth of water and natural wharfage that, without excavation or dredging, ships drawing 15 and 18 feet can be moored alongside its coast-line." The chapters on the cost of living and the rewards of labour show that, though high wages are paid, expenses are in full proportion, and the artisan as yet can save no more than he is able to do in England. This is the best work on South Africa that has appeared in some years.

Reise auf S. M. S. Möwe. Streifzüge in Südseekolonien und Ostasien. Von Johannes Wilda. 19 page pictures and a sketch map of the route. Second edition. 301 pp. Allgemeiner Verein für deutsche Litteratur. Berlin, 1903.

Sketches of travel written with vivacity and presenting many different phases of life and scene from the savagery of the Solomon Islands to the modern development of Hong Kong and Manila.

Guide Through Netherlands India. Translated from the Dutch by B. J. Berrington. 201 pp. Thomas Cook & Son, London, 1903. (Price, 1 sh.)

The Royal Packet Company of the Netherlands had this volume compiled for the convenience of visitors to the Dutch East Indies. As the vessels of the company visit all the important islands of the Colonies, the water routes are extensive, the inland routes for tourists being chiefly confined to Java and some coastal districts in other islands. The book describes the numerous points of interest, sketches the various peoples and their ways of living, quotes passage rates, etc. Besides many half-tone pictures there are coloured maps of Java, Dutch Borneo, and the Dutch East Indies, with large-scale plans of Batavia and other leading towns.

The Island of Formosa, Past and Present. By James W. Davidson, Consul of the United States for Formosa, pp. 646, besides Appendix and Index. Macmillan & Co., London and New York, 1903.

Mr. Davidson's book has occupied much of his time for eight years, during which he received a large amount of material from Japanese officials, surveyors, and other sources, besides engaging himself in extended studies in the island.

More than half of the volume is given to the history of Formosa from the earliest historic period, through the Dutch occupancy, terminating in 1661; the twenty-one years' reign of the able Chinese, Koxinga, who made a kingdom of Formosa; the long rule of the Chinese Government, which finally made Formosa a province of China; and the occupation of the island by Japan as the result of her war with China in 1894.

Mr. Davidson gives merely a summary of the geography and geology, but he treats the resources and industries with particular fulness; and a large number of the vital facts, which he gives in very interesting detail, are first presented to the general public in this book, and were collected either by himself or the Japanese.

A long chapter is given to the tea industry, which occupies a large area in the northern part of the island. The best quality of Oolong brings the highest price of any tea in the general trade. The camphor industry occupies a broad belt north and south through the centre of the northern two-thirds of the island in the western part of the mountainous region inhabited by the savages of Formosa. Nearly the whole supply of camphor comes from Formosa; and Mr. Davidson describes the method of collecting this product, a Government monopoly, and the hostile attitude of the savages towards the camphor collectors. In spite of the vigilance of the police about three persons are killed in the camphor camps every day.

The sugar industry, coal, and economic plants are very fully described; in fact, Mr. Davidson's treatment of the economic conditions in the island is almost as valuable and unique as his long section on the savages who occupy the eastern half of Formosa. These tribes, the aborigines of the island, were originally spread over the whole surface, but were finally driven from the wide western plain to the eastern mountains. The studies of Mr. Ino, who is the first authority on these wild peoples, provided Mr. Davidson with much new material with regard to all phases of life among these groups of savages. They number about 113,000, and occupy 7,500 square miles of territory. The other elements of the population are 2,730,000 Chinese, most of whose families have lived on the island for generations, and about 33,000 Japanese.

The final chapters deal with the commerce and industry of to-day and the progress the island is making under the new régime. The appendix includes comparative vocabularies of the nine savage groups, lists of the land birds and mammalia, climatic data, etc. A copious index gives easy access to the entire treasury of infor-

mation, and an economic map in colours shows the distribution over the island of its various resources, including minerals. This book will long be regarded as one of the fullest authorities on Formosa.

Canadian Year Book for 1903.—This publication, now in its sixth year, is a valuable work of reference on contemporaneous Canada. It contains nearly 400 pages, and is packed with information as to the government, products, trade, banks, and other kinds of business in the Dominion. It includes complete lists of the post offices, heads of departments in the Dominion and Provincial Governments, militia organizations, the customs schedules, and full statistics of the national finances and the foreign trade. Many half-tone pictures of public men are inserted. The book is marred by the distribution of advertisements throughout; but it may be too much to ask for perfection in a work containing so much information and selling for 25 cents. It is published by Alfred Hewett, Toronto.

Pamphlets from the Philadelphia Commercial Museum.—Among the recent publications of the Philadelphia Commercial Museum is a pamphlet, "The World's Commerce and American Industry," showing by a series of 86 charts the progress and present conditions of the world's commerce, of the manufacturing industries of the United States, and of British and American shipbuilding. The charts show more clearly than statistics alone would do what proportion of the world's trade belongs to each of the principal nations and the relative industrial importance of the leading cities of the United States. They are accompanied by letterpress amplifying the information. While chart 54, for example, shows the relative importance of our cities in the production of hosiery and knit goods, the note tells why they are now classed with cotton instead of woollen goods. The pamphlet is a quick and ready source of information on many essential features of commerce and manufacturing industries. Another pamphlet, "Commerce of Latin America," presents in twenty pages the most recent facts by means of charts and tables.

Ireland and Her Story. By Justin McCarthy. Horace Marshall and Son, London, 1903. (*The Story of the Empire Series.*)

Brief as it is, this book of less than 200 pages gives what the reader feels to be a temperate and truthful account of the Irish history from the legendary times to the present day. It is not

cheerful reading; but it humanises while it saddens, and those who are not wholly absorbed in their own concerns will learn, perhaps, from Mr. McCarthy's admirable pages to appreciate something of the magic that lives in the Dark Rosaleen.

NOTES AND NEWS.

THE ANNUAL MEETING of the Society will be held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, January 19, 1904, at 8.30 o'clock, P. M.

After the presentation and reading of reports, the election of officers and other business, the Hon. Robert Lansing will address the Society on the Questions Settled by the Award of the Alaskan Boundary Tribunal.

On the 23d of February the Rev. Putnam Cady will describe the Physical and Historical Geography of the Dead Sea Region.

THE CULLUM GEOGRAPHICAL MEDAL. The Council, at a meeting held on the 10th of December, unanimously awarded the Cullum Geographical Medal to Prof. Dr. Georg von Neumayer for services to the cause of scientific geography as explorer in Australia and as Director of the German Naval Observatory in Hamburg.

IN NOVEMBER the Royal Scottish Geographical Society conferred upon Robert E. Peary, C.E., U. S. N., President of the American Geographical Society, Honorary Membership and the Livingstone gold medal for his distinguished services in connection with North Polar Exploration in the years 1898–1902.

THE ANNUAL REPORT of the Smithsonian Institution for 1902 shows that the permanent fund amounts to $912,000. The receipts from all sources in the fiscal year ending June 30, 1902, were $150,774, and the expenditures were $69,653. Among the notable papers in the appendix are Guam and its People, by W. E. Safford; The Panama Route for a Ship Canal, by Prof. William H. Burr, and Volcanic Eruptions on Martinique and St. Vincent, by Prof. Israel C. Russell.

PROF. DR. RICHARD ANDREE, of Munich, the ethnographer, has been succeeded in the editorship of *Globus*, the geographical and anthropological weekly published at Brunswick, by Hermann Singer, the geographer. Dr. Andree will continue to contribute to the periodical.

DR. ADOLF MARCUSE, astronomer at the Royal Observatory and instructor at the University of Berlin, has taken charge of the department of geographical surveying in the *Geographisches Jahrbuch*, edited by Dr. Hermann Wagner. He requests that astronomers, geographers, and explorers send him publications or papers containing results which should be recorded.

DR. FRANZ STUHLMANN, the East African explorer, has been appointed Director of the Biological and Agricultural Institute at Amani, in German East Africa.

IT HAS BEEN REPORTED that Dr. and Mrs. Bullock Workman claim to have been the first explorers of the great Chogo Lungma glacier. The *Dresdner Anzeiger* of November 17 quotes from No. 21 of the *Mitteilungen des Deutschen und Österreichischen Alpenvereins* the following statement by Major Max Schlagintweit:

> The glacier region of the Congo Lungma was already explored in the year 1856 by my brother Adolf Schlagintweit, and Volume I of the Travels of the Brothers Schlagintweit presents a large view of this glacier. The Americans, Dr. and Mrs. Bullock Workman, were not, therefore, the first to set foot in that region, since their predecessor in its exploration was a German.

Brave men lived before Agamemnon, and we have yet to hear from the English and the Indians.

THE INDEX for the volume of 1903 will be distributed with BULLETIN NO. 1, 1904.

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